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PHOTOGRAPHS AND DESCRIPTIONS OF CUP-FUNGI—XVII. A NEW SPECIES OF GODRONIA [1]

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(WITH PLATE 9)

In working over the family Cenangiaceae preparatory to a monograph of the genus the writer has encountered some apparently undescribed species. Perhaps no genus of the family is more interesting than the genus *Godronia*, which is characterized by its filiform spores. The apothecia in this genus are usually strongly constricted above so that when young they closely resemble a perithecium with a large ostiole, although they often become more expanded at maturity. So closely do they resemble a Pyrenomycete that one species at least was originally placed in that group although the consistency is fleshy or leathery rather than carbonaceous.

In working over some tropical fungi the writer has encountered a very interesting species on the leaves of *Tetrazygia*. The apothecia themselves are so minute that they appear as delicate specks on the under sides of the leaves. When magnified, however, they show the unmistakable characters of the genus indicated above. The species is rather unique in that it is parasitic while most of the other species of the genus are strictly saprophytic. Another outstanding character of the species is the unusually large size of the asci and spores, which are several times larger than those of any of the other species of the genus

[1] This paper is preliminary to a monograph of North American Cup-fungi (inoperculates), a companion volume to North American Cup-fungi (opercu-lates), which was published by the author and issued in December, 1928.

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examined in spite of the small size of the apothecia. In fact, the asci were so long that they could not be drawn on the ordinary sized plate and it was barely possible to get the entire length of the spore by placing it diagonal as shown in the accompanying illustration. The following is the diagnoses of the species:

Godronia parasitica Seaver, sp. nov.

Apothecia scattered on the under side of the living leaf, especially along the midrib, erumpent, at first globose, becoming expanded but with the mouth constricted, black, reaching a diameter of .3–.5 mm.; hymenium dingy, more or less concealed; asci clavate, reaching a length of 250–300 μ and a diameter of 27 μ; spores filiform, nearly as long as the ascus and about 4 μ thick, many-septate, the number of the septa difficult to determine but more than 50 have been counted reaching a length of 250 μ; paraphyses slender and rather freely branched.

Apotheciis solitariis, hypophyllis, erumpentibus, primo subglobosis, dein urceolatis, nigris, .3–.5 mm. diam.; ascis subcylindraceis, octosporis, 27 × 250–300 μ; sporis filiformibus, multiseptatis, rectis vel leniter curvulis, 4 × 200–250 μ; paraphysis filiformibus, ramosis.

On leaves of *Tetrazygia longicollis*.

TYPE LOCALITY: Marmelade, Republic of Hayti.

DISTRIBUTION: Known only from the type locality.

This is described from material collected by Mr. George V. Nash, August 25, 1903 (Nash *793*). The species is distinguished by its huge asci and spores.

EXPLANATION OF PLATE 9

Photograph of several leaves of *Tetrazygia longicollis*, slightly enlarged, showing the minute apothecia with much enlarged sketch of two apothecia at the extreme right. At the left, drawing of a portion of an ascus with paraphyses and spores. Diagonally across the plate, a single spore removed from the ascus. Ascus, paraphyses and spores highly magnified.

MONOGRAPH OF THE GENUS PESTALOTIA [1]

PART II

E. F. GUBA

(WITH 4 TEXT FIGURES)

INTRODUCTION

In spite of the unique spore characters which clearly distinguish the genus *Pestalotia* from all other genera of fungi inexcusable mistakes have been made in the incorrect assignment of many species to this genus. Also, the eagerness with which some mycologists have accepted the opportunity to describe new species without making any serious effort to learn of those already existing has proved a serious evil. Much unnecessary synonymy has resulted which has required careful study to correct. The form and size of the conidium, the number, size and contrasted color of the colored cells, the number and length of the setae and the length of the pedicel offer a variety of distinguishing characters but these were given such inadequate consideration as to render many of the descriptions useless. As a result of such a state of affairs the incorrect designation of species is very prevalent in phytopathological and mycological literature.

DEFINITION OF SPECIES

The aim in this study has been to regard all good species as distinct individuals with regard to morphology and size but independent of host considerations. An accurate separation of species according to morphological characters in such a large group of individuals as the genus *Pestalotia* admittedly is difficult

[1] For Part I see Phytopathology **19**: 191–232, 1929.

The writer is gratefully indebted to Dr. C. W. Dodge of the Missouri Botanical Garden for helpful suggestions in the preparation of this manuscript and to Dr. David H. Linder of Harvard University for preparing the Latin diagnoses accompanying the new species.

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and could be greatly improved with some knowledge of physiological characters. However, since only dead type specimens are available and the utmost significance is attached to types only macroscopical and morphological characters and size could be employed as a basis for defining species. My studies show that the species are closely restricted to one host or several hosts in related genera. The identity of the host, consequently, has proved convenient in the determination of species at least, at present, in the absence of a complete conspectus of the genus.

The question frequently arises as to whether species of *Pestalotia* differ sufficiently morphologically to render them capable of definition. This feeling is entertained by many who have attempted to identify species using as guides earlier compilations, list and texts of fungi and even the original type descriptions. These compilations were prepared from type descriptions, occasionally reproduced in other publications and often emended to include forms on several hosts. Usually they are too abstract to give a proper representation of the type. Most of the original descriptions are carelessly and inaccurately prepared and inadequate to be of any use. This state of affairs has discouraged the efforts of taxonomists and most of us have been content to accept such names as *P. Guepini* Desm. and *P. funerea* Desm. for almost everything. My efforts have been applied to correct this situation and much work has already been accomplished in the completion of Parts I and II of this monograph.

The variety of characters and size peculiar to the conidia of *Pestalotia* provide a reliable means of separating species. Truly, morphological peculiarities occur but La Rue (**10**) was not able to find any strain constant for any morphological aberrances of the natural type. Aberrant spores always produced normal progeny. La Rue (**8**) found that selection is ineffective in establishing distinct lines within pure strains of *Pestalotia* and that mutations which give rise to lines significantly different from parent lines rarely occur. The dependability of spore measurements in delimiting species is closely connected with the constancy of spore size. La Rue (**9**) showed that, *in vitro*, spore size in the genus *Pestalotia* is not affected by the character of the medium used, the concentration of nutrients and any

variations in temperature. My extensive study of natural specimens leads me to accept the same conclusion. I am satisfied that the species can be defined and that a comprehensive monograph of the genus can be evolved on the basis of morphological and macroscopical characters and size.

PESTALOTIA OR PESTALOZZIA

My use of the original generic name *Pestalotia*, in preference to the modified spelling, *Pestalozzia*, is apparently not acceptable to some of our elder mycologists. The mere fact of having become accustomed to a name certainly does not justify its retention if it is shown that the modified spelling and pronunciation are not an improvement or grammatical correction of the original name. The change from *Pestalotia* to *Pestalozzia* apparently was made by Corda (Icones Fungorum **5**: 34. 1842) but Fairman (Mycologia **5**: 245. 1913) was the first to return to the original spelling, being influenced by competent opinions of Dr. J. H. Barnhart, librarian of The New York Botanical Garden, and Professor Henry F. Burton of the Department of Latin in Rochester University. Dr. Barnhart rendered the opinion that *Pestalotia* is as euphonious as *Pestalozzia* and preferable to it. Dr. Burton opined that Pestalotius is undoubtedly the correct Latin form for Pestalozzi. Classical Latin has no 'z' sound or character except in a few words borrowed from the Greek. The 'z' or 'zz' often stands for Latin 't' or 'ti' as in Palazzo (Palatium), Arezzo (Arretium), Firenze (Florentia) and Venezia (Venetia). We are, therefore, obliged to allow the original spelling to stand. To do otherwise is a violation of the rule of priority.

PATHOLOGIC STUDIES

The unsettled state of knowledge regarding the biology of the species was indicated in Part I of the monograph. Since then more evidence has been published showing the limited pathologic capabilities of the species in nature.

Cortez (**2**) confirmed earlier knowledge that *P. palmarum* Cooke is distinctly a wound parasite capable of causing the gray blight of cocoanut in the Philippines. White (**12**) in other studies determined that *P. palmarum* Cooke is unable directly

to infect healthy tissue of *Howea Forsteriana* but may follow other pathogens or gain entrance through injured areas. *P. Cuepini* Desm. was able to infect *Camellia japonica* only through wounds. He attributed the origin of the leaf spots commonly observed in greenhouses to sunscald. With *P. stellata* Berk. & Curt. from *Ilex opaca* the only successful means of inducing infection was by first scalding the leaves and applying a heavy spore suspension to the injured tissue. With *P. funerea* Desm. on freshly grafted *Cryptomeria* he determined that only the scions are susceptible to infection during the period the grafted stock is in the sweat boxes and that the scions may be killed before uniting with their stocks.

Kotthoff (**7**) was unable to infect *Azalea indica* L. (= *Rhododendron indicum* Sweet) with *P. macrotricha* Kleb. (not *P. versicolor* Speg.) which he recovered from plants shipped from Belgium and therefore believed that the fungus was probably a weak parasite capable of infecting *Rhododendron* only when weakened by unfavorable growing conditions. White (**11**) showed that *P. macrotricha* Kleb. and *P. Rhododendri* Guba were capable of infecting *Rhododendron* only through injuries and that these species are weak wound parasites. Howarth and Chippindale (**6**) found that *P. macrotricha* Kleb. grew in tissue rendered moribund on account of wounding but that it was unable to extend such infection into healthy tissue. They concluded that *P. macrotricha* Kleb. is parasitic only in sense that it can infect and kill tissue which is already in process of dying from some other cause; against healthy tissue the fungus is completely innocuous.

Howard (**5**) studied the relation of *Pestalotia* sp. to a disease of *Cinnamomum Camphora* Nees and Eberm. and found that injury from *Cryptothrips floridensis* Watson always preceded attacks of the fungus. Inoculation experiments with plants entirely free of thrips showed that this fungus was unable to attack healthy tissue but developed readily in dead portions of the host. He concluded that this fungus could be regarded only as a weak wound parasite of the camphor tree. Gäumann (**4**) isolated *Pestalotia* sp. (not *P. funerea* Desm.) from the basal parts of young nut trees where it caused a brown colored swelling.

He claimed to have reproduced the disease artificially but in view of so much negatory evidence of the ability of species of *Pestalotia* to cause swellings or constrictions Gäumann's results may rightfully be questioned.

It is evident from the literature dealing with the biologic relations of the species that very little if any importance can be attached to published reports crediting species of *Pestalotia* as being plant parasites. In general, species of *Pestalotia* are found in dead or dying organs resulting from other causes and usually they occur in company with other saprophytes or parasites. Until the biology of the species was investigated they were regarded as important plant parasites. Our interest in them now is largely taxonomic.

TAXONOMY

Section Quinqueloculatae Klebahn, Continued from Phytopathology **19**: 191–225. 1929

31. PESTALOTIA ADUSTA Ellis & Ev. Jour. Myc. **4**: 51. 1888. Sacc. Syll. Fung. **10**: 486. 1892.

Acervuli amphigenous, black, minute, 70–120 μ in diameter, free, spherical or sub-conic, punctiform, sub-epidermal, erumpent on maturity, seated on pale or brown circular, sharply margined spots, not exceeding .5 cm. in diameter, and on dead areas.

Conidia 5 celled, oblong or elliptic-fusoid, usually erect, tapering to the base, 16–20 μ; colored cells weak olivaceous, equally colored, guttulate, 11–14 $\times$ 5–7 μ, only slightly constricted at septa; terminal cells hyaline, the apical cell short conic or somewhat hidden, bearing a crest of 2 to 3, usually 3 setae, erect or divergent at right angles to the spore, 5–12 μ; basal cell short, obtuse, on a short straight pedicel, 2–7 μ (FIG. 1, 1).

On spots, dead tips, and margins of living leaves of *Prunus Cerasus* L. and *P. serotina* Ehrh.

P. adusta Ellis & Ev. was described on dead tips and margins of living leaves of cultivated plum trees. The tips and margins of the leaves are of a light gray color and appear as if scorched by fire. Type material was not examined but the specimens studied agree with the type description.

Specimens examined: on *Prunus serotina* Ehrh., Orient Point,

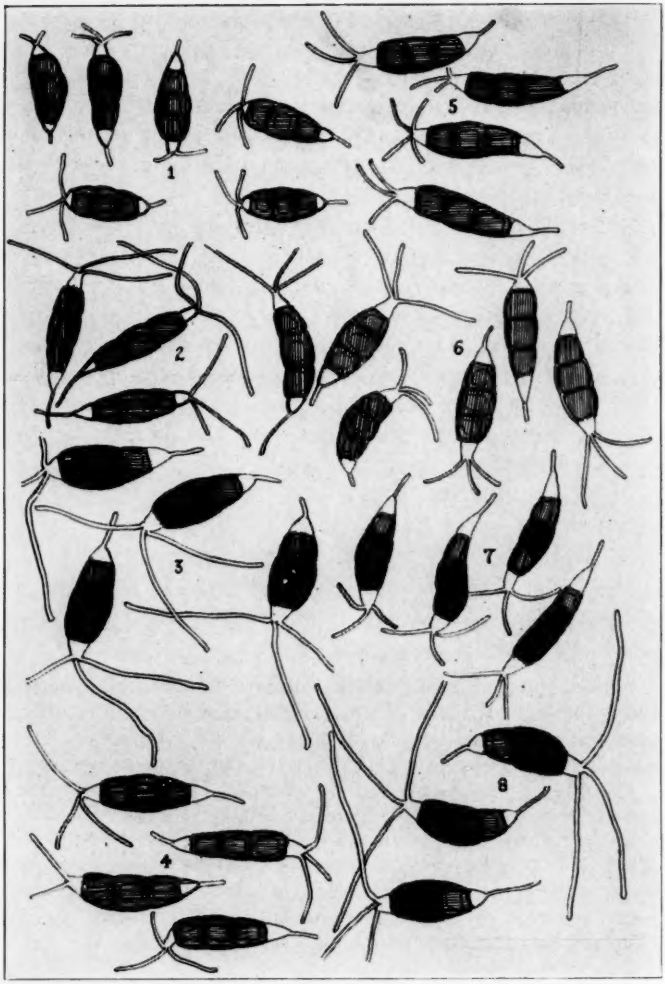

FIG. 1. Conidia: 1, *P. adusta* Ellis & Ev. from leaves of *Prunus serotina* Ehrh., Orient Point, N. Y., July, 1911, Roy Latham; 2, *P. annulata* Berk. & Curt. from leaves of *Ilex opaca* Ait., Alabama, Beaumont, Herb. Berkeley *4471*, in Herb. Roy. Bot. Gard., Kew; 3, *P. clavispora* Atk., from leaves of *Quercus* sp., Auburn, Alabama, Oct. 1891, Herb. G. F. Atkinson *2288;* 4, *P. microspora* Speg. from leaves of *Hedera Helix* L., Buenos Aires, Argentina, Apr. 1880, Spegazzini; 5, *P. dichaeta* Speg. from leaves of *Lythrea molleoides*, Corrientes, Argentina, Febr. 1905, Spegazzini; 6, *P. disseminata* Thümen from leaves of *Eucalyptus globulus* Labill, Choupal, Portugal, June 1879, A. Moller, in Herb. Jard. Bot. Univers. Coimbra *568;* 7, *P. Gaultheriae* Dearn. & House from leaves of *Gaultheria* sp., Piedro de Lino, Panama, Febr. 1918, E. P. Killip; 8, *P. longiseta* Speg. from leaves of *Rubus fructicola*, Conegliano, Italy, Nov. 1876, Spegazzini. × 750.

N. Y., July 31, 1911, Roy Latham, in Herb. N. Y. State Museum; Arlington, Va., Nov. 10, 1929, R. W. Davidson, in Myc. Coll. U. S. D. A. sub *Pestalotia* sp.; on *Prunus Cerasus* L., Orient Point, N. Y., Aug. 7, 1911, Roy Latham, in Herb. N. Y. State Museum.

32. **Pestalotia Aletridis** (Pat.) Guba, comb. nov.

Pestalozzina Aletridis Pat., in Duss, Énum. Méth. Champ. Guadel. et Mart. 90. 1903. Sacc. Syll. Fung. **18**: 475. 1906.

Fruiting pustules 50–150 μ in diameter, subglobose, punctiform, numerous, largely epiphyllous, at first subepidermal, later erumpent, seated on pale, dead spots with definite borders.

Conidia 5 celled, oblong or elliptic-clavate, tapering to the base, erect, 16–17 μ, median cells pale-olivaceous, equally colored, only slightly constricted at the septa, guttulate, 10–13 $\times$ 5–7 μ; apical hyaline cell short, cylindric, bearing 2 divergent setae, 6–10 μ; basal hyaline cell usually broad conic; pedicel 1–2 μ, erect.

On dried leaves of *Aletris fragrans* L., Basse-Terre, Guadalupe, R. P. Duss in Herb. Patouillard at Harvard University.

33. PESTALOTIA ANNULATA Berk. & Curt. Grevillea **2**: 155. 1874. Sacc. Syll. Fung. **3**: 787. 1885.

Pustules punctiform, black, subglobose, mostly epiphyllous, annulate or concentrically disposed, surrounded by the torn epidermis, 125–250 μ in diameter, sometimes springing from large marginal spots with definite dark borders or in other cases generally distributed over the matrix.

Conidia long, fusiform, tapering toward the base, 5 celled, 24–30 μ, erect, sometimes prominently constricted at septa, median cells olivaceous, equally colored, 17–21 $\times$ 6–8 μ, guttulate; end cells elongate, the basal long conic, tapering into an erect pedicel, 6–12 μ, attenuated downwards; apical cell long, cylindric, bearing 2–4, usually 3, widely divergent setae, 15–22 μ, frequently knobbed at the extremities (FIG. 1, 2).

On leaves of *Ilex opaca* Ait., usually on spots. Specimens examined: Herb. Berkeley *4471*, Alabama, Beaumont in Herb. Roy. Bot. Gard., Kew; Ellis, N. Am. Fungi *34* sub *P. stellata* Berk. & Curt.; Herb. J. B. Ellis *2599*, Newfield, N. J. sub *P. stellata* Berk. & Curt.

34. PESTALOTIA BATATAE Ellis & Ev. Jour. Myc. **8**: 65. 1902. Sacc. Syll. Fung. **18**: 481. 1906.

Pustules numerous, gregarious and coalescing, subcuticular, raising cuticle in hemispherical manner, roughening and blackening the surface of the tuber, forming black, thick crust.

Conidia oblong-clavate, constricted at septa, 5 celled, erect, 23–28 μ; median cells guttulate, 15–18 $\times$ 7–8 μ, the two upper umber or only slightly darker than the lowest colored cell: apical hyaline cell long, conic or cylindric, basal long, conic, dilute olivaceous; setae 3, spreading, 7–16 μ; pedicel short, 2–4 μ.

On tubers of *Batatas edulis* Choisy (= *Ipomoea Batatas* Lam.), Tuskegee, Ala., Sept., 1900, G. W. Carver in Herb. Ellis, New York Bot. Gard.

Ellis stated that the conidia of *P. Batatae* Ellis & Ev. are hardly distinguishable from those of *P. Guepini* Desm. The two species according to my study are totally distinct.

35. PESTALOTIA BICOLOR Ellis & Ev. Bull. Torrey Club **27**: 575. 1900. Sacc. Syll. Fung. **16**: 1016. 1902.

Pustules amphigenous, punctate, subglobose or subcespitose, coalescing freely, 50–125 μ in diameter, erumpent at maturity, the black contents spreading over the surface.

Conidia oblong-fusoid, 5 celled, 19–25 $\times$ 6–8 μ, the median cells 13–15 μ, guttulate, the upper two colored cells darker than the lowest; setae 3 to 5, usually 3, often 4, sometimes forked, 12–20 μ; basal hyaline cell obtuse, apical cell cylindric or conic; pedicel erect, 4–8 μ.

On dead leaves of *Salix* sp., Tuskegee, Ala., Dec. 12, 1897, G. W. Carver, No. *387* in Herb. Farlow, Harvard University; on *Salix nigra* Marsh., Tuskegee, Ala., Nov. 3, 1926, G. W. Carver.

Ellis emphasized the light color of the acervuli and stated that this character distinguished this species from *P. Guepini* Desm. The light colored markings on the leaves are not related to the fungus. The acervuli are punctate, distinctly black and small.

36. PESTALOTIA CAFFRA Sydow, Ann. Myc. **12**: 266. 1914.

Fruiting pustules amphigenous, largely epiphyllous, irregularly distributed, small, erumpent, raised above the epidermis in the form of a cone, surrounded by the torn shreds of the epidermis,

collapsing and the sooty contents spreading over the matrix; seated on dry brown areas with yellowish elevated margins, largely of insect origin.

Conidia broad clavate, 5 celled, not constricted at the septa, 24–28 μ; median cells 16–19 $\times$ 8–11 μ, upper 2 colored cells umber, the lowest olivaceous; setae 3, widely divergent, 20–26 μ, superior cell somewhat short, basal cell tapering; pedicel erect, 2–7 μ.

On living leaves of *Mimusops caffra* E. Mey., Isipingo, Natal, Nov. 1913, E. M. Dodge in Herb. Sydow, Mus. Bot. Stockholm, Sweden.

37. PESTALOTIA CAUDATA Sydow, Bull. L'Herb. Boiss. II. **1**: 84. 1900. Sacc. Syll. Fung. **16**: 1017. 1902.

Pustules subglobose or lenticular, subepidermal, erumpent, black, scattered, later disposed in a series, confluent or hysteriform, up to 1 cm. long.

Conidia long, fusiform, erect, tapering at the ends, 5 celled, 28–35 μ; median cells olivaceous, the center one umber, not constricted at the septa, 18–21 $\times$ 6–7 μ; apical hyaline cell long cylindric, bearing usually 3, sometimes 2 or 4 filiform setae, 18–24 μ, rather uniform in length, divergent and reflexed; basal cell long, acute or tailed; pedicel up to 12 μ.

On stems of Cyperaceae (gen. indet.), Serra do Itatiaia, Brazil, E. Ule *2143* in Herb. Sydow, Mus. Bot. Stockholm, Sweden. This is a very characteristic species having long, narrow conidia and a prolonged tail-like inferior cell.

38. PESTALOTIA CLAVISPORA Atkinson, Bull. Cornell Univ. **3**[1]: 37. 1897. Sacc. Syll. Fung. **14**: 1028. 1899.

Pustules largely epiphyllous, numerous, 150–250 μ in diameter, scattered and loosely gregarious in places, immersed, opening by a minute pore, the spores exuding in black coils, spreading and blackening the matrix.

Conidia usually clavate-fusoid, tapering to the base, straight or unequilateral and irregular in shape and size, 5 celled, 19–26 μ, slightly constricted at septa; upper two colored cells umber or fuliginous, the lowest olivaceous, 14–16 $\times$ 7–8 μ; apical cell broad conic to cylindric, short, often somewhat hidden, bearing 3 or rarely 4 rarely branched setae, 20–28 μ, divergent; basal cell usually acute, often swollen; pedicel 4–7 μ (FIG. 1, 3).

On fallen somewhat green leaves of *Quercus* sp., Auburn, Ala., Oct. 3, 1891. Herb. G. F. Atkinson *2288*, Cornell University.

The black pustules are generally scattered over the upper leaf surface.

39. PESTALOTIA COCCOLOBAE Ellis & Ev. Field Columb. Mus. (Bot.) **1**: 286. 1896. Sacc. Syll. Fung. **14**: 1028. 1899.

Pustules amphigenous, sparse, punctiform, largely on one surface, globose, tearing epidermis irregularly, 80–180 μ in diameter, seated on pale, circular sunken spots with brown borders, .5–2 cm. in diameter.

Conidia broad clavate, frequently unequilateral, 5 celled, constricted at septa dividing the lower colored cells, 18–22 $\times$ 7–9 μ; median cells 13–15 μ, the two upper fuliginous, opaque, the lowest umber; upper hyaline cell bearing 2, or usually 3 coarse setae, 15–27 μ; lower hyaline cell long, tapering into an erect pedicel, 2–7 μ.

On leaves of *Coccoloba uvifera* L., associated with pale, circular spots with brown margins.

Specimens examined: Yucatan, Mexico, 1895. Millspaugh, *3* in Herb. Farlow, Harvard University, and Herb. New York Bot. Gard.; Stevens, Porto Rican F. *339b*, Bogeron, Porto Rico, Feb. 15, 1913, F. L. Stevens; Herb. C. E. Chardon *484* and Herb. Whetzel and Olive *655*, Mayaguez, Porto Rico, March 3, 1916, in Herb. Cornell University.

The type description mentions 3 septate spores but error is due apparently to invisibility of septa dividing the upper opaque cells. The spores of the type specimens have 3, or rarely 2 setae, not 1 to 4 as stated in the original description. Ellis (Bull. Torrey Club **27**: 576, 1900) reported *P. Coccolobae* Ellis & Ev. on leaves of *Coccoloba uvifera* L. from southern Florida submitted by H. H. Hume and noted its variations from the type. The material from Florida is a distinct species.

40. PESTALOTIA CRYPTOMERIAE Cooke, Grevillea **12**: 24, 1883. Sacc. Syll. Fung. **3**: 792. 1895.

Pustules sparse, black, convex, subglobose, minute.

Conidia 5 celled, elliptic-fusoid, erect, 15–17 μ; median cells umber or olivaceous, equally colored, guttulate, hardly constricted at septa, 10–12 $\times$ 5–7 μ; apical hyaline cell short, conic, sometimes long cylindric, bearing a crest of 3, or sometimes 2 short setae, 5–13 μ, basal cell short, obtuse or rounded at the base, supported by a short stalk, 2–5 μ.

On needles of *Cryptomeria japonica* D. Don, Aiken, So. Carolina, in Ravenel Fungi Am. Ex. *554*.

Short elliptic-fusoid spores crested with 3 short setae and minute acervuli characterize this species.

41. PESTALOTIA CUPRESSINA Niessl, Hedwigia **22**: 188. 1883. Sacc. Syll. Fung. **3**: 792. 1885 = *P. funerea* Desm. 1843. See Phytopathology **19**: 202. 1929.

On dead twigs of *Cupressus glauca* Lam. near Coimbra, Portugal. Herb. Niessl *687* and Herb. Jard. Bot. Univers. Coimbra *1132*.

Fungus was described with two septate spores crested with 4–6 setae. The conidia are distinctly 5 celled and the specimen is identical with *P. funerea* Desm.

42. PESTALOTIA DICHAETA Speg. Anal. Mus. Nac. Buenos Aires III. **13**: 411–412. 1911. Sacc. Syll. Fung. **22**: 1220. 1913.

Pustules amphigenous, subglobose, scattered, occasionally gregarious and confluent, innate in the parenchyma, on maturity perforating the epidermis, circinate, issuing in black coils, 200–250 μ in diameter.

Conidia usually slightly curved, long fusiform, tapering to the base, 20–25 μ, hardly constricted at the septa; median cells guttulate, olivaceous, equally colored, the two upper cells sometimes slightly darker, 13–15 $\times$ 5–7 μ; apical cell long cylindric, bearing usually 3, sometimes 2, but rarely 4 short, divergent setae, 6–14 μ; basal cell long, tapering; pedicel 2–6 μ (FIG. 1, 5).

On weathered leaves of *Lythrea molleoides*, Bella Vista, Corrientes, Argentina, Febr. 1905, Spegazzini.

The usual number of setae is three; therefore, the specific name of the fungus is misleading. According to rules, however, it must be allowed to stand.

43. PESTALOTIA DISSEMINATA Thümen, Inst. Revista Sci. Coimbra **28**: 501. 1880. Febr. 1881. Sacc. Syll. Fung. **3**: 784. 1885.

P. Eucalypti Thümen, Inst. Revista Sci. Coimbra **28**: 501–502. 1880. Febr. 1881. Sacc. Syll. Fung. **3**: 785. 1885.

P. Molleriana Thümen, Myc. Univ. *1988*, July 1881. Guba, Phytopathology **19**: 223. 1929.

Fruiting pustules amphigenous, mostly epiphyllous, numerous, disseminate and usually distinct, globose-conic, projecting, pyramidal, at first covered, then erumpent, rupturing the epidermis or deposing it completely, exposing the globose black pustule, 100–225 μ in diameter, seated without order.

Conidia 5 celled, elliptic-fusoid or less often clavate, usually erect and slightly constricted at the septa, 19–25 μ; median cells olivaceous, equally colored or the two upper sometimes slightly darker than the lowest, 13–17 $\times$ 6–8 μ; end cells hyaline, prominent, the apical cell conic, the basal cell acute and tapering; pedicel erect, short, 3–7 μ; setae 3, usually bent sideward, 9–17 μ (FIG. 1, 6).

On dead leaves of *Eucalyptus globulus* Labill., Choupal near Coimbra, Portugal.

Specimens examined: Contr. Flor. Myc. Lust. *578* (Ser. III) in Herb. Jard. Bot. Univers. Coimbra, *568*, June 1879, A. Moller; Rabenhorst, Fungi Eu. *3094*, winter of 1883; Roumeguère, F. Sel. Gall. Ex. *4069*, Jan. 1887; Contr. Flor. Myc. Lust. *579* (Ser. III) in Herb. Jard. Bot. Univers. Coimbra, *523* and *589*, May and June 1879, A. Moller, sub *P. Eucalypti* Thümen; on dried, fallen leaves of *Eucalyptus* sp., Choupal near Coimbra, Portugal, Oct. 1879, A. Moller, in Thümen, Myc. Univ. *1988*, and Roumeguère, Fung. Sel. Gall. Ex. *5167* sub *P. Molleriana* Thümen.

All the collections listed were made by Moller in Choupal, Portugal, in the period 1879 to 1887. The descriptions of *P. disseminata* Thümen and *P. Eucalypti* Thümen were published in the order given; therefore, *P. disseminata* Thümen has priority. *P. Molleriana* Thümen was described and distributed in Thümen, Myc. Univ. *1988* under date of July 1881 and, therefore, also becomes a synonym. All the specimens are identical. Thümen states that the conidia of *P. disseminata* Thümen are 5 septate but the writer's study fails to confirm this opinion. Thümen also claims that *P. disseminata* Thümen is distinct from *P. Eucalypti* Thümen by the disposition of the fruiting pustules and the dimensions of the conidia, but neither is confirmed. Thümen's descriptions of the three species are essentially alike.

44. PESTALOTIA EUGENIAE Thümen, Inst. Sci. Coimbra II. **27**: 326. 1880. Sacc. Syll. Fung. **3**: 785. 1884.

Acervuli epiphyllous, scattered, solitary, globose-lenticular, black, 75–120 μ in diameter, sometimes arranged concentrically,

borne under the papery epidermis and erumpent at maturity, situated in small whitish or brownish spots of different shapes with narrow purple margins, the papery interior desiccated, with age breaking and falling out in shreds.

Conidia 5 celled, elliptic-fusoid or oblong-elliptic, usually erect, 19–23 μ; median cells olivaceous, equally colored, only slightly constricted at septa, 14–16 $\times$ 6–7 μ; end cells short conic; setae 3, divergent, 3–11 μ; pedicel short.

On living leaves of *Eugenia uniflora* L., Contr. Myc. Lusit. *342*, Ser. II, in Herb. Jard. Bot. Univers. Coimbra *204*, Botanic Garden, Coimbra, Portugal, Nov. 1878, A. Moller.

45. PESTALOTIA GAULTHERIAE Dearn. & House, Ann. Rep. N. Y. State Mus. 1924. Bull. N. Y. State Mus. **266**: 94. 1925.

Pustules subglobose, amphigenous, mostly hypophyllous, generally distributed and seated without order, erumpent, breaking epidermis irregularly and margined by the ruptured cuticle, 90–225 μ in diameter.

Conidia narrow-fusoid, 5 celled, curved or angled, 20–25 μ, only slightly constricted at the septa; interior cells olivaceous, the two upper somewhat darker than the lowest, 14–16 $\times$ 5–7 μ; end cells hyaline or dilute yellow, prominent, the apical long cylindric or conic, bearing 3 or occasionally 4 setae, 6–16 μ, the basal long and acute, tapering into an erect pedicel, 4–10 μ (FIG. 1, 7).

On brown languishing leaves of *Gaultheria* sp., summit of Piedro de Lino, Panama, E. P. Killip, Febr. 24, 1918, Herb. New York State Museum, Albany.

46. PESTALOTIA GIBBEROSA Sacc. Accad. Sci. Veneto-Trentino-Istriana III. **10**: 83. 1917; Philippine Agric. **8**: 32–37. 1919.

Pustules amphigenous, distributed without order, circinate, 100–200 μ in diameter, erumpent at maturity and carrying away the epidermis, exposing the black contents, the sooty contents covering the matrix.

Conidia 5 celled, 15–18 μ, erect, usually equilateral, clavate or elliptic-fusoid, usually not gibbous; median cells guttulate, the two upper umber or darker than the lowest, 10–13 μ $\times$ 5–6 μ; apical hyaline cell cylindric, narrow, crowned with usually 3 or sometimes 2 or 4 divergent setae, 9–17 μ; basal hyaline cell broad conic; pedicel 2–7 μ, erect.

On leaves of *Litsea glutinosa* Robinson, Los Banos, Philippines, December 1913, C. F. Baker in Baker, F. Malayana *375* in Herb. Farlow, Harvard University.

47. PESTALOTIA JAPONICA Sydow, Hedwigia **38**: 144. 1899. Sacc. Syll. Fung. **16**: 1013. 1902.

Fruiting bodies subglobose or lenticular, numerous, sparse, punctiform, amphigenous, 85–175 μ in diameter, seated on dead brown marginal areas.

Conidia short, oblong or elliptic-fusoid, 5 celled, not constricted at the septa, 19–24 μ; median colored cells 14–16 $\times$ 8–10 μ, two upper cells umber, the lowest olivaceous; apical hyaline cell short conic, basal cell short obtuse or rounded; setae 3, frequently 4, straight, 12–20 μ; pedicel erect, short, 2–5 μ.

On living leaves of *Cedrela sinensis* Juss., Botanic Garden, Tokio, Japan, Oct. 31, 1898, M. Miyoshii, in Herb. Sydow, Mus. Bot. Stockholm, Sweden.

48. PESTALOTIA LESPEDEZAE Sydow, Mem. Bull. L'Herb. Boissier **4**: 6. 1900. Sacc. Syll. Fung. **16**: 1015. 1902.

Pustules largely epiphyllous, punctiform, erumpent and surrounded by torn shreds of the epidermis, circinate, scattered, 100–150 μ in diameter, seated on brown spots, 2–5 mm. in diameter, and dead marginal areas of irregular shapes.

Conidia 5 celled, oblong-elliptic, 20–25 μ; median cells umber or olivaceous, equally colored, guttulate, 14–17 $\times$ 7–8.5 μ; setae 2 or 3, usually 3, divergent, 18–24 μ; basal cell obtuse; apical cell conic; pedicel short, erect, about 5 μ.

On living or wilting leaves of *Lespedeza bicolor* Turcz., Botanic Garden, Tokio, Japan, 1898, Kusano, in Herb. Sydow, Mus. Bot. Stockholm, Sweden.

49. PESTALOTIA LONGISETA Speg. Michelia **1**: 478. 1879. Sacc. Syll. Fung. **3**: 787. 1885.

Pustules sparse, epiphyllous, punctiform, lenticular or subspherical, black, 100–200 μ in diameter, seated on reddish or brown spots not exceeding .5 cm. in diameter, surrounded by a purple or black margin.

Conidia erect or curved, fusiform, hardly constricted at the septa, 22–25 μ; colored cells 13–18 $\times$ 7.6–8.6 μ, guttulate, the 2 upper umber, the lowest olivaceous; end cells hyaline, prominent, the apical cell conic, bearing 3 or rarely 4 coarse and widely

divergent setae, 18–38 μ; basal cell conic, abruptly contracted into a narrow pedicel 4–11 μ (FIG. 1, 8).

On living leaves of *Rubus caesius* L., Susegana, Conegliano, Italy, Nov. 1876, Spegazzini.

According to Spegazzini the type occurs on *Rubus caesius* L. The collection studied bears the date and locality of the type but the host given is *R. fructicola*, an error. The fungus agrees in every respect with the original description and is regarded as the type. The long setae are characteristic of this species.

50. **Pestalotia macrochaeta** (Speg.) Guba, comb. nov.

P. funerea Desm. var. *macrochaeta* Speg. Anal. Mus. Nac. Buenos Aires III. **13**: 412. 1911. Sacc. Syll. Fung. **22**: 1226. 1913.

Pustules scattered, 100–200 μ in diameter, lenticular, erumpent, the sooty contents spread over the matrix.

Conidia elliptic-fusoid, usually erect, slightly constricted at septa, 16–20 μ; median cells guttulate, olivaceous, equally colored, 11–14 × 5–6 μ; basal cell broad conic, abruptly obtuse; apical cell short conic or cylindric, bearing 3 setae, 8–14 μ, divergent; pedicel 2–7 μ (FIG. 2, 15).

On fallen needles of *Pinus sylvestris* L., Villa Elisa, Argentina, Aug. 1908, Spegazzini.

The needles are sparsely dotted with black pustules. The fungus shows no affinity to *P. funerea* Desm., therefore, should be renamed. According to Spegazzini, the setae are 30 μ long, whence the name, but study shows that the setae usually do not exceed 16 μ in length.

51. PESTALOTIA MACROSPORA Cesati, in Fres. Beit. Myk. 54–56. 1852; Klotsch, Herb. Myc. Fung. **17**: 1663. 1852. nomen nudum; Sacc. Syll. Fung. **3**: 796. 1885. Klebahn, Myc. Centralbl. **4**: 3. 1914.

P. Pteridis Sacc. in Thümen, Myc. Univ. *83*. 1875; Sacc. Syll. Fung. **15**: 242. 1901.

P. funerea Desm. var. *typica* Sacc. Michelia **I**: 479. 1879. Sacc. Syll. Fung. **3**: 791. 1885.

Pustules globose-lenticular, mostly epiphyllous, sparse or crowded, sometimes coalescing, subepidermal, erumpent on maturity, darkening the substratum, 140–275 μ in diameter.

Conidia 5 celled, erect, long clavate, 30–40 × 7–9 μ; median colored cells 20–29 μ, cylindric, olivaceous, equally colored or slightly contrasted; apical hyaline cell small, obtuse, bearing a crest of 3–5, or usually 4–5 setae arising separately or in pairs and often branched, 15–22 μ; basal hyaline cell long, acute, tapering into a rather long pedicel, 6–11 μ (FIG. 2, 9).

On blighted fronds of *Pteris aquilina* L. Fungus is characterized by long clavate spores, small apical cell and crest of numerous simple or branched setae.

Specimens examined: Klotsch, Herb. Myc. Fung. **17**: *1663*, 1852, Cesati; D. Saccardo, Myc. Ital. *1175*, Monte'lo near Treviso, Italy, Sept. 1902; P. Sacc. Myc. Veneta *326*, Montello, Italy; Petrak, F. Albanici et Bosniaci Ex. *33*, Sept. 29, 1918, F. Petrak; Rabenhorst, Herb. Myc. *66* and Ex. Herb. Thümen and Thümen, Myc. Univ. *83*, Montello, Italy, Sept. 1874, P. Saccardo, sub *P. Pteridis* Sacc.; Herb. Patouillard, Harvard University, Honnet, France, Trabut, sub *P. funerea* Desm. var. *typica* Sacc.

Accurate illustrations of this species were prepared by Voglino (Atti. Soc. Veneto-Trent. Sci. Nat. Padova **9**: *pl. 4, fig. 22*, 1885), Saccardo (Fung. italici autographie delineati, Patavia, 1876–1886, Table *1114*) and Klebahn (Myc. Centralbl. **4**: 1914, *fig. 34*). Saccardo (Michelia **1**: 479. 1879) reported *P. funerea* Desm. var. *typica* Sacc. on *Pteris aquilina* L., *Photinia serrulata* Lindl., *Eucalyptus Stewenianus*, *Rubus fruticosus* L., *Euonymus chinensis* Lindl., *Thuja* and *Cupressus* but Saccardo's assertion of such wide host range is incorrect.

52. **Pestalotia maculiformans** Guba & Zeller, sp. nov.

Acervuli punctiformes, epiphylli, innato-erumpentes, 175–300 μ diam., in maculis rotundis 1.5–5 mm. diam., "wood brown" vel cinereo-canis et purpureo- vel rubro-brunneis praetextis; conidiis fusoideis, rectis, 5-cellularibus, 22–28 × 7–9 μ, leniter ad septa constrictis; loculis 3 mediis guttulatis, infimis olivaceis, 2 superioribus obscurioribus, 15–18 μ, cellulis extremis prominentibus, infera turbinata, supera cylindracea in cilia 3, raro 2–4, abeunte, ciliis inaequalibus, 9–20 μ longis; conidiophoris rectis, 3–7 μ longis.

Acervuli epiphyllous, punctiform, subepidermal, becoming erumpent by an asteroid rupture of the epidermis, 175–300 μ in diameter, sooty from discharged spores at maturity, seated on

circular spots 1.5–5 mm. in diameter, wood brown to ashen grey on upper surface, with purplish or reddish brown border, almost concolorous below (FIG. 4).

Conidia fusoid, erect, 5 celled, 22–28 × 7–9 μ, slightly constricted at the septa; three central cells guttulate, the lowest olivaceous, the two upper darker, 15–18 μ; terminal cells prominent, the basal conic, the apical cylindric with 3, rarely 2 or 4 setae, irregular in length, 9–20 μ; pedicel erect, 3–7 μ.

Associated with distinct, circular spots on living leaves of *Vaccinium ovatum* Pursh west of the Coast Range in Oregon, U. S. A.

P. maculiformans Guba & Zeller differs from *P. Vaccinii* (Shear) Guba in having broader conidia, shorter setae, and epiphyllous fruiting bodies. *P. Vaccinii* (Shear) Guba is not associated with leaf spots but completely covers the dead leaves. The illustration is taken from the type.

Specimens examined: Several collections from different locations near Waldport, Lincoln County, Oregon, S. M. Zeller, August 15 and October, 1929, in Herb. Oregon Agr. Coll., *4879* type, etc.; in Herb. Zeller, *7565* type, etc.; in Herb. Guba, *7565* type, etc.

53. **Pestalotia Micheneri** Guba, sp. nov.

P. Araucariae Berk. & Curt., nomen nudum, in Herb. Michener **19**: 81. *2517*, Mycology and Disease Survey, U. S. D. A.

Acervuli gregarii, nonnunquam coalescentes, amphigeni, globoso-lenticulari, innati deinde linis erumpentes, 160–240 × 80–160 μ; conidiis 5-cellularibus, rectis vel curvatis, anguste fusoideis vel clavatis, utrinque fastigatis, 19–23 μ, vix ad septa constrictis, loculis mediis dilute olivaceis, guttulatis, 13–15 × 5–7 μ, cellulis extremis longe turbinatis, supera angusta, triciliata, ciliis inaequalibus, 4–12 μ longis, infera longa acuta; conidiophoris rectis, 3–5 μ longis.

Fruiting pustules gregarious, sometimes coalescing, amphigenous, globose-lenticular, subepidermal, erumpent in a linear manner and surrounded by the torn epidermis, 160–240 × 80–160 μ, densely distributed over the entire leaf surface.

Conidia 5 celled, erect or curved, narrow fusoid or clavate, tapering at both ends, 19–23 μ, hardly constricted at the septa; median cells dilute olivaceous and equally colored, prominently

guttulate, 13–15 × 5–7 μ; end cells long conic, tapering, the apical cell narrow with a crest of 3 erect setae of unequal length, 4–12 μ, the basal cell long, acute; pedicel erect, 3–5 μ (FIG. 2, 11).

On leaves of *Araucaria imbricata* Pav. (= *A. araucana* Koch.), North Garden, Chester Co., Pennsylvania, 1885.

Specimens examined: Michener (Herb. Michener **19**: 81. *2517*), United States Dept. Agr. sub *P. Guepini* Desm. and sub *P. Araucariae* Berk. & Curt., and in Herb. Curtis, Harvard University, sub *P. Guepini* Desm.

According to data accompanying the specimen in the Curtis Herbarium, Curtis received material as *2517* from Michener and assigned it the name *P. Araucariae* Berk. & Curt. Curtis sent material to Berkeley as *5564* and the latter changed the name to *P. Guepini* Desm. This conclusion is entertained because the original name *P. Araucariae* Berk. & Curt., still legible on the packet in the Curtis collection, was erased and *P. Guepini* Desm. written over it while the Michener collection bears both names, *P. Guepini* Desm. being written above *P. Araucariae* Berk. & Curt.

This species is characterized by narrow fusoid conidia, 3 short, erect setae and dilute olivaceous colored cells.

54. PESTALOTIA MICROSPORA Speg. Anal. Soc. Ci. Argent. **10**: 31–32. 1880. Sacc. Syll. Fung. **3**: 789. 1885.

Pustules conic, hemispherical, amphigenous, loosely gregarious, dense in places, rarely confluent, erumpent, 72–150 μ in diameter.

Conidia 5 celled, narrow fusoid, tapering to the base, erect or sometimes slightly curved, hardly constricted at septa, 19–23 μ; median cells olivaceous, equally colored, guttulate, 13–15 × 5–7 μ; apical hyaline cell short, conic or cylindric, bearing a crest of 3 straight setae, 6–14 μ; basal hyaline cell long, tapering; pedicel 4–5 μ (FIG. 1, 4).

On pale or brown weathered leaves of *Hedera Helix* L., Botanic Garden, College of Argentina, Buenos Aires, Apr. 1880, Spegazzini.

55. PESTALOTIA MONTELLICA Sacc. & Vogl. Atti. Soc. Veneto-Trentina Sci. Nat. Padova **9**: 215–216. 1885. Sacc. Syll. Fung. **10**: 489. 1892.

P. Lucae Savelli, Bull. Soc. Bot. Ital. **6–7**: 62–68. 1917.

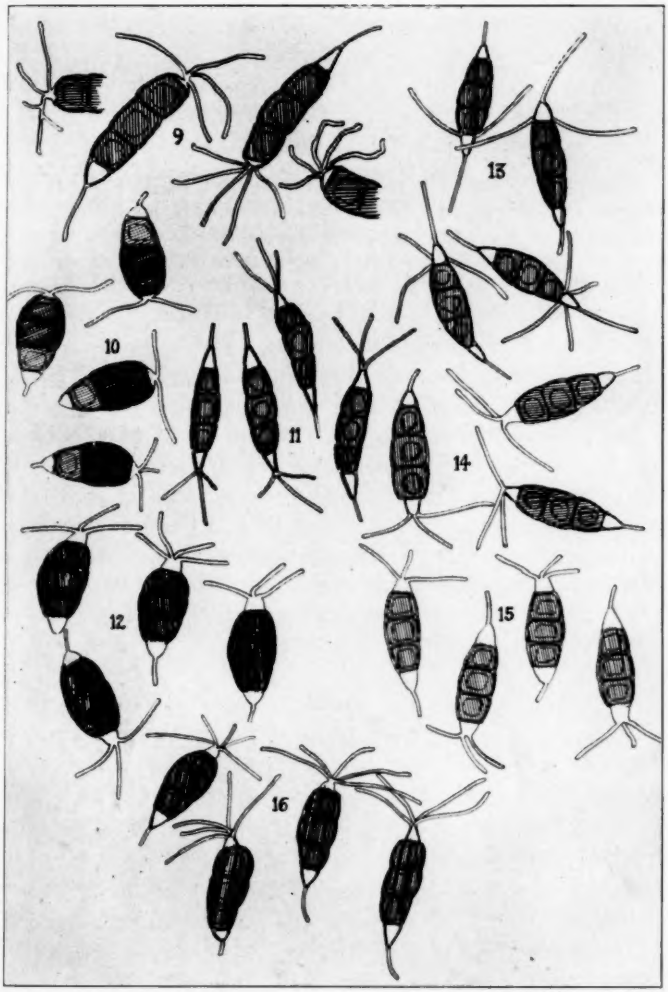

FIG. 2. Conidia: 9, *P. macrospora* Cesati from fronds of *Pteris aquilina* L., Montello, Italy, Sept. 1874, Saccardo, Ex Herb. Thümen; 10, *P. Myricae* Ellis & Martin from leaves of *Myrica cerifera* L., Green Cove Springs, Florida, Dec. 1882, G. Martin, Ellis, N. Am. Fungi *1222;* 11, *P. Micheneri* Guba from leaves of *Araucaria imbricata* Pav., Chester County, Pennsylvania, 1885, Michener, Herb. Michener *2517;* 12, *P. pampeana* Speg. from twigs of *Discaria americana* Gill & Hook., Cordova, Argentina, April 1905, Spegazzini; 13, *P. montellica* Sacc. & Vogl. from leaves of *Quercus tinctoria* Bartr., West Chester, Pennsylvania, B. M. Everhart, Ellis & Ev. Fungi Columb. *1352;* 14, *P. neglecta* Thümen from leaves of *Euonymus japonicus* L., Conegliano, Italy, Oct. 1876, Spegazzini, Thümen, Myc. Univ. *884;* 15, *P. macrochaeta* (Speg.) Guba from needles of *Pinus sylvestris* L., Villa Elisa, Argentina, Aug. 1908, Spegazzini; 16, *P. polychaetia* Cooke & Hark. from twigs of *Cytisus* sp., California, Herb. Roy. Bot. Gard., Kew *2095.* × 750.

Pustules subglobose, punctiform, amphigenous, distinct or dense in places, circular, 120–175 μ in diameter, seated generally over the surface.

Conidia 5 celled, erect, fusiform, 21–26 μ; median cells olivaceous, equally colored, not constricted at septa, 15–17 × 6–7 μ; end cells narrow, tapering, the apical cell beaked with one vertical bristle and usually 3, sometimes 2 reflexed bristles arising from the base of the apical cell, 12–17 μ; pedicel erect, 4–9 μ (FIG. 2, 13).

On leaves of *Quercus tinctoria* Bartr. (= *Q. velutina* Lam.) in Ellis & Ev. Fungi Columb. *1352*, West Chester, Penna., B. M. Everhart sub *P. stellata* Berk. & Curt.

The presence of 3 setae around the base of the apical cell and one at the apex is characteristic of this species. Contrary to the opinion of Cooke and Ellis (Grevillea **6**: 85. 1878) this fungus is not identical with *P. stellata* Berk. & Curt., which occurs on leaves of *Ilex opaca*. The specimen on leaves of *Quercus velutina* Lam. agrees in every respect with *P. montellica* Sacc. & Vogl., the type of which was described on leaves of *Quercus* sp. collected in the forests of Montello in northern Italy by P. Saccardo.

Savelli (l.c.) created the species *P. Lucae* Sav. on leaves of *Quercus ilex* L. var. *agrifolia*, which according to his description differs from *P. montellica* Sacc. & Vogl. in that the conidia measure 28–29 × 10–11 μ and the setae number 3 of which 1 is terminal and 2 are reflected from the base of the apical cell. Another distinction which Savelli offers to support the individuality of *P. Lucae* Savelli is its association with leaf spots while *P. montellica* Sacc. & Vogl. is not so associated. *P. Lucae* Savelli is regarded as a synonym.

56. PESTALOTIA MYRICAE Ellis & Martin, Am. Nat. **18**: 70. 1884. Sacc. Syll. Fung. **3**: 785. 1885.

Pustules minute, sparse, amphigenous, innate-erumpent, circular, 50–100 μ, limited to dead, irregularly shaped, discolored areas.

Conidia broad-elliptic or ovoid, 5 celled, erect, hardly constricted at the septa, 17–20 μ; upper two colored cells umber, the lowest olivaceous, 12–16 × 7–9 μ; end cells hyaline, the basal broad conic, abruptly contracted into a short pedicel, 2–5 μ; apical cell short, often indistinct, bearing at its extremity 2, sometimes 3 usually straight and oppositely divergent setae, 8–14 μ (FIG. 2, 10).

On partly fresh leaves of *Myrica cerifera* L. in Ellis, N. Am. Fungi *1222*, Green Cove Springs, Florida, Dec. 1882, G. Martin.

The original description of this fungus is unsatisfactory. The conidia are wrongly described with 2 septa and their dimensions are inaccurately stated.

57. PESTALOTIA NEGLECTA Thümen, Inst. Rev. Sci. Coimbra II. **27**: 326. 1880. Sacc. Syll. Fung. **3**: 788. 1885.

P. funerea Desm. var. *Euonymi-japonici* Thümen, Myc. Univ. *884*, 1887, nomen nudum.

Pustules amphigenous, usually epiphyllous, numerous, densely gregarious in places, coalescing but usually free, globose-conic, subepidermal, raising the epidermis then surrounded by its torn shreds, exposing the sooty contents, usually 100–150 μ in diameter, generally distributed and at maturity blackening the matrix.

Conidia 5 celled, narrow fusiform, erect or often curved, tapering to a point at the base, usually 20–26 μ, slightly constricted at the septa; median colored cells pale olivaceous, guttulate, 13–16 $\times$ 5–7 μ, the two upper colored cells often darker than the lower; apical hyaline cell long cylindric or conic, bearing a crest of 3 setae, 9–23 μ, usually less than 20 μ and curved; basal hyaline cell long, attenuated into an erect pedicel, 3–7 μ (FIG. 2, 14).

On dead brown or somewhat green leaves of *Euonymus japonicus* L. associated with other fungi.

Specimens examined: Thümen, Myc. Univ. *884*, Venetia, Conegliano, Italy, October 1876, Spegazzini, sub *P. funerea* var *Euonymi-japonici* Thümen; Contr. Myc. Lusit. *343* (Ser. II) in Herb. Jard. Bot. Univers. Coimbra, Portugal, *275*, Zombaria, Portugal, Jan. 1879, A. Moller; Herb. A. B. Langlois **17**: 11, *86* sub *P. Euonymi* Vize; Office Foreign Plant Quar. and Insp. U. S. D. A., Society Hill, So. Carolina, Oct. 30, 1916, J. T. Rogers.

This species is characterized by narrow pointed conidia crested with 3 setae. The fruiting pustules are densely arranged on either surface of the browned leaves. The type collected by Spegazzini at Conegliano, Italy, and named *P. funerea* Desm. var. *Euonymi-japonici* Thümen but not described is wholly unlike *P. funerea* Desm. A later collection by Moller at Zombaria, Portugal, also submitted to Thümen for identification was described with the name *P. neglecta* Thümen. The two

specimens are identical and since this species is distinct from all others the name *P. neglecta* Thümen is retained.

Klebahn (Myc. Centralbl. **4**: 10–11. 1914) wrongly included *P. funerea* Desm. var. *Euonymi-japonici* Thümen (= *P. neglecta* Thümen) in his concept of *P. gracilis* Klebahn. The latter name was also applied to several different species of *Pestalotia* of which the first listed occurs on *Laurus Sassafras* (= *Sassafras varifolium* (Salisb.) Ktze.) in Ellis & Ev. Fungi Columb. *370b* sub *P. Guepini* Desm. and which is the type of *P. gracilis* Klebahn according to Guba (Phytopathology **19**: 217. 1929).

58. PESTALOTIA OXYANTHI Thümen, Inst. Rev. Sci. Coimbra **28**: 420. 1880. Sacc. Syll. Fung. **3**: 790. 1884.

Acervuli largely hypophyllous, numerous, punctiform, hemispherical or applanate, subepidermal, erumpent and surrounded by the torn epidermis, the flat circular outline of the pustule exposed to view, generally distributed, 150–225 μ in diameter.

Conidia 5 celled, long and narrow clavate, tapering toward the ends, erect or curved, 24–29 μ, median cells 16–19 $\times$ 6–7 μ, guttulate, the upper two cells umber, the lowest olivaceous, only slightly constricted at the septa; apical hyaline cell long, narrow, cylindric or conic, the basal cell long, tapering, acute; setae usually 3, rarely 2 or 4, flexuous, 13–30 μ; pedicel short, erect, 3–10 μ.

On dead leaves of *Oxyanthus pubescens* in greenhouse, Botanic Garden, Coimbra, Portugal, August, 1879, A. Moller *641* and Contr. Myc. Lusit. *574* (Ser. III) in Herb. Jard. Bot. Univers. Coimbra.

59. PESTALOTIA PAMPEANA Speg. Anal. Mus. Nac. Buenos Aires III. **13**: 412. 1911. Sacc. Syll. Fung. **22**: 1220. 1913.

Acervuli black, sparse, innate in the cortex, later erumpent, circular, subglobose, 75–225 μ in diameter, on pale spots girdling the twigs with distinct brown margins.

Conidia 5 celled, broad elliptic to ovoid, erect, 17.5–20 μ, often strongly constricted at the middle septa; median cells thick walled, cask shaped, short, umber or fuliginous, equally colored, 11–13.5 $\times$ 7.7–9 μ; apical cell short conic, usually small, bearing a crest of 3, or rarely 4 erect setae, 6–11 μ; basal cell small, short conic, abruptly contracted into an erect pedicel, 4–7 μ (FIG. 2, 12).

On living twigs of *Discaria americana* Gill & Hook., Cordova, Argentina, April 1905, Spegazzini.

The original description is not adapted to the type specimens. Illustrations of the conidia deposited with the type material show long, flexuous pedicels and long setae. My study reveals short pedicels and short setae and 4 rather than 3 septate conidia.

60. PESTALOTIA PEREGRINA Ellis & Martin, Jour. Myc. **1**: 100. 1885. Sacc. Syll. Fung. **10**: 490. 1892.

Pustules amphigenous, lenticular or elongate-elliptic, scattered but frequently confluent, covered at first, later erumpent, raised and effuse, blackening the matrix, 80–120 × 50–70 μ.

Conidia oblong-elliptic or obovate, 5 celled, 21–24 μ, hardly constricted at the septa; median cells guttulate, olivaceous, equally colored, 13–17 × 6–8 μ; hyaline end cells short, subconical, prominent, crest of 3 divergent setae, 8–17 μ or about equal to the length of the colored cells; pedicel erect, 6–9 μ.

On dead leaves of cut-off branches of *Pinus austriaca* Link (= *P. Laricio* Poir.), Newfield, N. J., May 1885, in Ellis & Ev. N. Am. Fungi 2nd Ser. *1627*.

61. PESTALOTIA PLANIMI Vize, Grevillea **5**: 109. 1877. Sacc. Syll. Fung. **3**: 788. 1885.

P. Euonymi Vize, Bull. Calif. Acad. Sci. **2**: 161. 1885. Sacc. Syll. Fung. **15**: 242. 1901.

P. spectabilis Klebahn, Myc. Centralbl. **4**: 3. 1914.

Pustules amphigenous, subglobose, numerous, gregarious, coalescing freely, subepidermal, then erumpent, rupturing epidermis in radiating manner, black sooty contents spreading over the matrix, 175–350 μ in diameter, generally distributed.

Conidia 5 celled, long fusiform, tapering to the base, erect, slightly constricted at the septa, 29–37 μ; median cells guttulate, the upper two umber, cylindric, the lowest olivaceous, conic, 20–26 × 8–10 μ; end cells hyaline, large, the apical cell long cylindric, bearing a crest of 3 or sometimes 2 long curved setae, 20–40 μ, the basal cell long, tapering into a slender pedicel, 6–11 μ (FIG. 3, 17).

On dead weathered leaves of *Euonymus japonicus* L., associated with other fungi. Black sooty masses of spores stand out in striking contrast to the pale brown colored matrix.

Specimens examined: Ellis, N. Am. Fungi *758*, San Francisco,

California, 1881, H. W. Harkness; Thümen, Myc. Univ. *2085*, Ibid., sub *P. Planimi* Vize var. *Euonymi-japonici* Thümen; Dept. Plant Path. N. Y. State Coll. Agr. *6762*, California, G. F. Meschutt; Thümen, Myc. Univ. *884b*, Coimbra, Portugal,

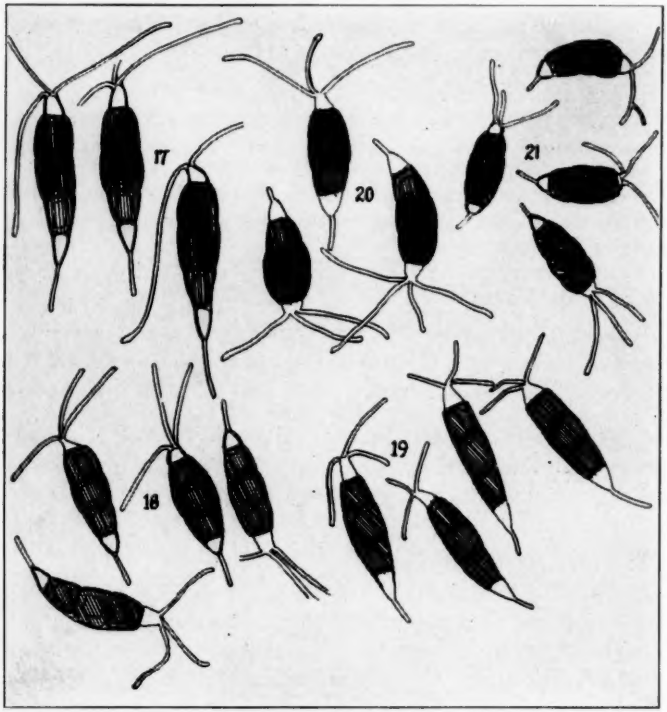

FIG. 3. Conidia: 17, *P. Planimi* Vize from leaves of *Euonymus japonicus* L., San Francisco, Calif., 1881, Harkness, Ellis, N. Am. Fungi *758;* 18, *P. quercina* Guba from leaves of *Quercus tinctoria* Bartr., Ellis, N. Am. Fungi *34;* 19, *P. Royenae* Guba from leaves of *Royena lucida* L., Padua, Italy, Nov. 1897, in D. Sacc. Myc. Ital. *182;* 20, *P. scirpina* Ellis & Martin from culms of *Scirpus palustris* L., Palermo, Argentina, May 1881, Spegazzini; 21, *P. vaccinicola* Guba from leaves of *Vaccinium arboreum* March, Green Cove Springs, Florida, G. Martin, Ellis & Ev. Fungi Columb. *1352*. × 750.

Jan. 1879, A. Moller, sub *P. funerea* Desm. var. *Euonymi-japonici* Thümen.

The conidia of this species are unusually large. The fungus

was named *P. Planimi* Vize and wrongly reported on dead stems of *Planimus*. Harkness made known the error and stated that the name should be *P. Euonymi* Vize and the host *Euonymus japonicus* L. There is, however, no rule which would permit this change. Therefore, the original name, although inconsistent, must be retained.

Klebahn (Myc. Centralbl. **4**: 3. 1914) made a new species, *P. spectabilis* Kleb., of the specimen in Thümen, Myc. Univ. *884b* sub *P. funerea* Desm. var. *Euonymi-japonici* Thümen, but my study of this fungus shows that it is identical with *P. Planimi* Vize.

62. PESTALOTIA POLYCHAETIA Cooke & Hark. Grevillea **12**: 94. 1884. Sacc. Syll. Fung. **3**: 785. 1885.

Pustules black, subglobose, scattered, subepidermal, covered at length, then erumpent, tearing epidermis in stellate manner and surrounded by the torn epidermis, 250–290 μ in diameter.

Conidia 5 celled, usually erect, broad clavate, only slightly constricted at septa, 26–29 μ; median cells guttulate, umber, 17.5–20 $\times$ 8.4–9.4 μ; apical cell cylindric or long conic; basal cell long conic, tapering; setae 4–6, usually 5, 9–25 μ; pedicel erect, 4–9.8 μ (FIG. 2, 16).

On twigs of *Cytisus* sp., California, in Herb. Roy. Bot. Gard., Kew, *2095*.

The type description which is in error mentions 3 celled spores and otherwise is lacking in details necessary to a good understanding of the species.

63. PESTALOTIA PSIDII Pat. Bull. Soc. Myc. Fr. **8**: 136. 1892, nomen nudum. Bull. Soc. Myc. Fr. **11**: 232. 1895. Sacc. Syll. Fung. **14**: 1025. 1899.

Pustules gregarious, lenticular or subglobose, innate-erumpent, tearing the epidermis in a circinate manner, 100–200 μ wide.

Conidia 5 celled, oblong-clavate or elliptic-fusoid, erect, hardly constricted at the septa, 21–25 μ; median colored cells guttulate, olivaceous, the two upper slightly darker than the lowest, 15–18 $\times$ 6–8 μ; end cells hyaline, the apical cell conic or cylindric, crowned with 3 setae, the basal cell obtuse; pedicel 3–5 μ, erect.

On fruits of *Psidium pomiferum* L. (= *P. Guajava* L.), Ecuador, Sept. 1891, G. de Lagerheim.

64. PESTALOTIA QUADRICILIATA Bub. & Dearn. Hedwigia **58**: 31. 1916.

Pustules subglobose to lenticular, epiphyllous, immersed and covered by the epidermis, 90–175 μ wide, sparse, seated on circular brown spots not exceeding .8 cm. in diameter.

Conidia elliptic-fusoid or broad clavate, 5 celled, 21–26 μ, erect; median cells olivaceous or umber, equally colored, 15–18 × 8–10 μ, slightly constricted at the septa; apical cell conic, crowned with 4 slender setae, 9–17 μ; basal cell obtuse or rounded, seated on a short pedicel, 2–5 μ.

On partly green leaves of *Vitis vulpina* Bartram (= *V. labrusca* L.), London, Canada, October 9, 1910, J. Dearness. The fungus is secondary and the spots are apparently due to a *Phyllosticta* which is present in greater abundance.

65. **Pestalotia quercina** Guba, sp. nov.

Acervuli amphigeni, innato-erumpentes, 80–150 μ in diam., fumosi, conidiis fusoideis vel clavatis rectis 5 cellularibus, 19–25 × 6–7 μ, leniter ad septa constrictis; loculis 3 mediis guttulatis, olivaceis, 13–16 μ; cellulis extremis prominentibus, hyalinis, apicalibus late-cylindraceis, triciliatis, ciliis raro ramosis, 11–19 μ longis; conidiophoris rectis, 6–9 μ longis.

Acervuli amphigenous, innate-erumpent, numerous, scattered or gregarious, circular, 80–150 μ in diameter, sooty at maturity.

Conidia 5 celled, fusoid-clavate, tapering to the base, erect, hardly constricted at the septa, 19–25 × 6–7 μ; median cells guttulate, olivaceous, equally colored, 13–16 μ; exterior cells hyaline, prominent; apical cell frequently broad cylindric with a crest of 3 setae, 11–19 μ, rarely branched; pedicel erect, 6–9 μ (FIG. 3, 18).

On dead weathered leaves of *Quercus tinctoria* Bartr. (= *Q. velutina* Lam.) associated with *Discosia* sp.

Specimens examined: Ellis, N. Am. Fungi *34* sub *P. stellata* Berk. & Curt.; on *Quercus* sp., Arlington, Va., March 31, 1929, C. L. Shear, *5785*. The fungus shows no similarity to *P. stellata* Berk. & Curt. on leaves of *Ilex opaca* Ait. or to *P. montellica* Sacc. & Vogl. on leaves of *Quercus*.

66. **Pestalotia Royenae** Guba, sp. nov.

P. funerea Desm. var. *Royenae* D. Sacc. Myc. Ital. **2**: 182. 1898, nomen nudum.

Acervuli hypophylli, globoso-lenticulares, numerosi generaliter distributi et saepe gregarii, erumpentes, prominentes, 50–160 μ diam.; conidiis 5 cellularibus, rectis, vel nonnunquam leniter curvatis, vix ad septa constrictis, 22–25 μ, loculis mediis olivaceis aequaliter coloratis vel 2 superioribus leviter obscurioribus, guttulatis, 15–17 × 5–7 μ; cellulis extremis prominentibus, infera acute fastigata in pedicillum filiforme conidium separans, supera cylindracea triciliata, ciliis rectis brevibus, 4–11 μ longis; conidiophoris 2–7 μ longis.

Pustules hypophyllous, globose-lenticular, numerous, generally distributed and gregarious in places, erumpent on maturity, protruding and surrounded by the torn epidermis, the contents sooty and spreading, 50–160 μ in diameter.

Conidia 5 celled, erect or sometimes slightly curved, long fusoid, tapering to the base, hardly constricted at the septa, 22–25 μ; median cells olivaceous, equally colored or the two upper somewhat darker, guttulate, 15–17 × 5–7 μ; setae 3, short, straight, 4–11 μ; apical cell cylindric, basal acute, tapering into a short stalk, 2–7 μ (FIG. 3, 19).

On weathered leaves of *Royena lucida* L., Botanic Garden, Padua, Italy, Nov. 1897.

In D. Saccardo Myc. Ital. *182* reference is made apparently to a description of this species in Sacc. Syll. Fung. **3**: 791. 1885, but the reference is in error and no earlier publication of *P. funerea* Desm. var. *Royenae* D. Sacc. can be found.

67. PESTALOTIA SCIRROFACIENS Brown, Phytopathology **10**: 383–393. 1920.

Pustules immersed, later erumpent, covered with an irregular layer of thickened bark.

Conidia ovate-oblong to spindle shape, 5 celled, slightly curved, 22–29 × 7–10 μ; lowest colored cell olivaceous, the two above umber or fuliginous, 14–19 μ, with slight or no constriction at the septa; setae 3, rarely 4, bent at right angles to the spore, 9–23 μ; end cells conic, the basal sometimes tapering; pedicel short, erect, 3–6 μ.

On bark of *Sapota Achras* Mill., associated with hard woody galls or tumors partly covered with lichens, algae and other fungi, Buena Vista, Florida, P. H. Rolfs.

Study was confined to a culture received from Miss Nellie Brown. Host tissue bearing the fungus was not available but Brown (l.c.) has supplied the spore measurements on different media as follows:

On *Sapota Achras* Mill..... 16–24 × 6–10 μ
On potato pieces..... 20–26 × 5–6 μ
On corn meal agar..... 16–30 × 6–8 μ

Doyer (Meded. Phytopath. Lab. "Willie Comm. Scholt" **9**: 1–72. 1925) found that the 3 middle cells ranged in length mostly from 15–18.5 μ.

Brown regarded this species as the cause of tumors on stems of the sapodilla tree and her contention is supported by artificial production of the disease. Older tissue was especially susceptible. Leaves of sapodilla inoculated with the sapodilla-tumor *Pestalotia* produced reddish well defined spots and the conidia recovered from these spots maintained the typical characteristics of those produced in the tumor. She also produced by artificial methods of inoculation tumors on mango (*Mangifera indica* L.), olive (*Olea europaea* L.) and balsam (*Abies balsamea* Mill.) and the fungus was again recovered from these tumors. On larch (*Larix occidentalis* Nutt.), blue spruce (*Picea pungens* Engelm.) and hemlock (*Tsuga canadensis* Carr.) the fungus produced a blight instead of outgrowths. Wounding was unnecessary for infection but helped to increase it.

Doyer, using Brown's original culture of *P. scirrofaciens* Brown, was unable to produce galls or blight after a long series of attempts and consequently denied the infectious nature of this species. Further biologic studies are desirable in view of the fact that the results of more recent investigations dealing with the biology of species of *Pestalotia* show definitely the innocuous nature of the species to healthy tissue.

Doyer believed that *P. scirrofaciens* Brown is the same as *P. versicolor* Speg. The writer's study of both forms indicates a very close relationship.

68. PESTALOTIA SORBI Pat. Rev. Myc. **8**: 182. 1886. Sacc. Syll. Fung. **10**: 486. 1892.

Pustules black, epiphyllous, sparse, punctiform, circular, on small brown orbicular spots less than 1 cm. in diameter.

Conidia elliptic-fusoid, 5 celled, erect, 16–18 × 5–7 μ, constricted at the septa; median cells umber, equally colored, 11–13 μ; setae 2 or rarely 3, divergent, 8–11 μ; basal cell obtuse, apical cell short cylindric; pedicel 1–4 μ, short.

On leaves of *Sorbus* sp., Yunnam, China, 1887, Delavay, in Herb. Patouillard in Herb. Farlow, Harvard University.

69. PESTALOTIA STICTICA Berk. & Curt. Grevillea **2**: 155. 1874. Sacc. Syll. Fung. **3**: 793. 1885.

Pustules globose-lenticular, numerous, black, largely hypophyllous, scattered over the matrix, frequently coalescing, 50–125 μ in diameter.

Conidia 5 celled, elliptic-fusoid, 18–22 μ, somewhat swollen through the middle, usually erect; colored cells 12–15 $\times$ 6–8 μ, guttulate, hardly constricted at the septa, upper two usually darker than the lowest; apical cell long conic, crested with 3 divergent setae, 7–16 μ; basal cell obtuse, supported by an erect pedicel, 4–8 μ.

On brown fallen leaves of *Platanus occidentalis* L., Santee River, So. Carolina, Ravenel in Herb. Curtis *1638* at Harvard University and Herb. Berkeley in Herb. Roy. Bot. Gard., Kew.

The type description which is very vague also embraces fungus on leaves of *Tilia* sp. from Alabama (Beaumont, *4608*) but this is a distinct species, *P. Tiliae* Guba. Since the type description of *P. stictica* Berk. & Curt. suggests application to the species on *Platanus* its restriction to that species is accepted.

70. PESTALOTIA SYDOWIANA Bresadola, Hedwigia Beibl. **35**: 32–33. 1896. Sacc. & Sydow in Sacc. Syll. Fung. **14**: 1027. 1899.

Acervuli globose-lenticular, epiphyllous, sparse or densely gregarious, erumpent and surrounded by the torn epidermis, 150–300 μ in diameter, on angular ash-gray or brown spots surrounded by a red margin.

Conidia 5 celled, erect, elliptic-fusoid, 24–28 μ; median cells guttulate, olivaceous, the two upper darker than the lowest, 16–19 $\times$ 8–9.5 μ, hardly constricted at the septa; apical hyaline cell long and broad cylindric; basal hyaline cell broad conic; setae 3, usually divergent or recurved, flexuous, 24–40 μ; pedicel 6–12 μ.

On living leaves of *Gaultheria procumbens* L., Botanic Garden, Berlin, Germany, 1894–95, P. Sydow, in Sydow, Myc. Marth. *4372*.

71. **Pestalotia Tiliae** Guba, sp. nov.

Acervuli amphigeni, gregarii vel remoti, innati deinde erumpentes, epidermide lacerata cincti, atri, effusi, 75–200 μ diam.,

in maculis brunneis; conidiis late fusoideis vel pyriformibus, plerumque inaequilateralibus, 24–29 μ, cellulis mediis coloratis 16–19 × 9.5–11.5 μ, cellulis 2 superis fuliginiis, opacis, subglobosis vel inflatis, infimis "umber" forte ad septa constrictis, cellulis extremis prominentibus, infera longa turbinataque, supera hyalina brevi turbinata triciliata; ciliis crassis, 18–27 μ, divergentibus; conidiophoris 4–7 μ longis.

Pustules amphigenous, scattered or gregarious, subepidermal, erumpent on maturity, surrounded by the torn shreds of the epidermis, black, effuse, 75–200 μ in diameter, seated on large definite brown areas.

Conidia broad fusoid or pyriform, usually inequilateral, 24–29 μ; median colored cells 16–19 × 9.5–11.5 μ, the upper two colored cells fuliginous, opaque, subglobose or swollen, the lowest umber, strongly constricted at the dividing septum; apical hyaline cell short, conic, the basal usually long and tapering; setae 3, coarse, 18–27 μ, widely divergent; pedicel 4–7 μ.

On leaves of *Tilia* sp., Santee River, Alabama, in Herb. Curtis *4608* (Beaumont, *266*) at Harvard University and Herb. Roy. Bot. Gard., Kew, sub *P. stictica* Berk. & Curt.

The type of *P. stictica* Berk. & Curt. was described on leaves of *Platanus occidentalis* L. and *Tilia* sp. The specimens on both hosts are distinct and since the characters of the form on *Platanus* agree best with the type description of *P. stictica* Berk. & Curt. the new name *P. Tiliae* Guba is assigned to the form on *Tilia*.

72. **Pestalotia vaccinicola** Guba, sp. nov.

Acervuli epiphilli, punctiformes, erumpentes, epidermide lacerata cincti, 45–90 μ diam. in maculis definitis rotundatis .5 cm. minoribus supra albidis, infra brunneis; conidiis ellipticefusoideis, 5 cellularibus, rectis vel leniter curvatis, loculis mediis aequaliter coloratis, guttulatis, 10–13 × 5–7 μ; cellulis extremis breve turbinatis; ciliis saepe 3 raro 2, saepe ramosis divergentibusque, 4–11 μ longis; conidiophoris rectis, 2–5 μ longis.

Pustules epiphyllous, punctiform, subepidermal, erumpent at maturity and surrounded by the torn epidermis, 45–90 μ in diameter, seated in small definite circular spots not exceeding .5 cm. in diameter, pale whitish above and brown beneath.

Conidia elliptic-fusoid, 5 celled, 15–18 μ, erect or slightly curved; median cells dark olivaceous, equally colored, guttulate, 10–13 × 5–7 μ; end cells short conic; setae usually 3, sometimes 2, often branched, divergent, 4–11 μ; pedicel erect, 2–5 μ (FIG. 3, 21).

On living leaves of *Vaccinium arboreum* Marsh., Green Cove Springs, Fla., G. Martin in Ellis & Ev. Fung. Columb. *1352* sub *P. stellata* Berk. & Curt.

The fungus is always associated with leaf spots. This exsiccati collection contains leaves of *Quercus tinctoria* Bartr. (= *Q. velutina* Lim.) and *Vaccinium arboreum* Marsh., each of which bears distinct types of *Pestalotia* and neither of which resembles *P. stellata* Berk. & Curt. The type on *Quercus* has been named *P. quercina* Guba.

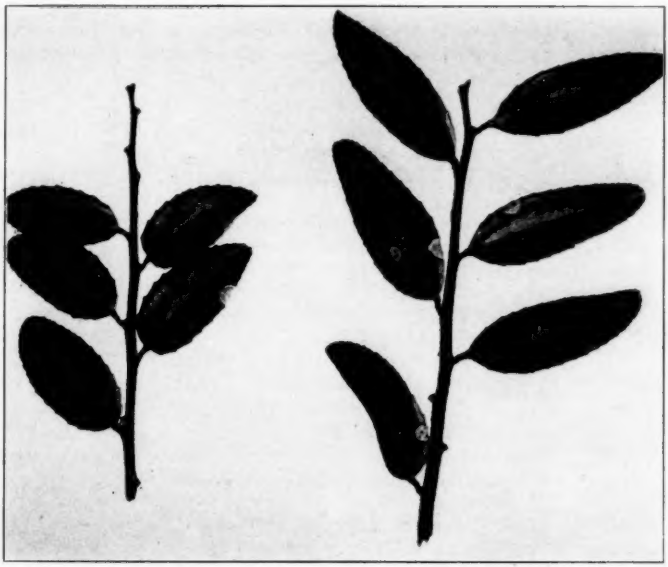

FIG. 4. Leaf spots on *Vaccinium ovatum* Pursh., bearing *P. maculiformans* Guba & Zeller. Photo by S. M. Zeller.

73. PESTALOTIA VERSICOLOR Speg. var. AMERICANA Speg. Anal. Soc. Ci. Argent. **13**: 21. 1882. Sacc. Syll. Fung. **3**: 791. 1885. = *P. scirpina* Ellis & Martin, Am. Nat. **19**: 76. 1885. Phytopathology **19**: 208. 1929.

On fallen decaying culms of *Scirpus palustris* L. (= *Eleocharis palustris* R. Br.), Rio de la Plata, Palermo, Argentina, May 15, 1881, Spegazzini (FIG. 3, 20).

Saccardo (Syll. Fung. **15**: 241. 1901) listed *P. americana* Speg. as a synonym of *P. versicolor* Speg. var. *americana* Speg., but I have been unable to find any mention of *P. americana* Speg. in Spegazzini's publications.

P. americana Montagne in Gay, Historia de Chile (Bot.) **7**: 481. 1850 is *Monochaetia americana* (Mont.) Sacc. according to Saccardo (Syll. Fung. **18**: 485. 1906).

KEY TO SPECIES IN PARTS I AND II

The usefulness of this key is limited to those species of *Pestalotia* reported in Parts I and II of this monograph. For Part I see Phytopathology **19**: 191–232. 1929. In using this key mean dimensions and typical characters should be strongly emphasized. Aberrant characters should not be considered.

a. Setae 2 or usually 2.
  b. Conidia 16–18 μ.
    c. Colored cells 10–13 × 5–7 μ.
      d. Setae 6–12 μ.
        e. Colored cells pale olivaceous, equally colored ..... *P. Aletridis.*
        ee. Colored cells umber, equally colored.... *P. Sorbi.*
  bb. Conidia 17–20 μ, broad elliptic or ovoid.
    c. Colored cells 12–16 × 7–9 μ.
      d. Setae 2 or 3, 8–14 μ ..... *P. Myricae.*
  bbb. Conidia 20–25 μ.
    c. Colored cells 13–15 × 5–7 μ.
      d. Setae 6–14 μ.
        e. Colored cells olivaceous, equally colored.
          g. Pustules subglobose, 200–250 μ... *P. dichaeta.*
    cc. Colored cells 15–17 × 5–7 μ.
      d. Setae 5–11 μ.
        e. Upper 2 colored cells umber, the lowest olivaceous.
          g. Pustules subglobose, 100–200 μ... *P. copernica.*

aa. Setae 3 or usually 3.
  b. Conidia 13–20 μ.
    c. Colored cells 10–15 × 4–6 μ.
      d. Setae 8–16 μ, arising from different points on rounded apex.
        e. Colored cells pale olivaceous, equally colored.
          f. Conidia 18–23 μ: pustules 225–500 × 100–200 μ ..... *P. unicolor.*
      dd. Setae 8–14 μ, arising at apex of terminal cell.
        e. Colored cells olivaceous, equally colored.
          f. Conidia 16–20 μ: pustules 100–200 μ . *P. macrochaeta.*

cc. Colored cells 10–15 × 5–7 μ.
d. Setae 4–12 μ.
e. Colored cells olivaceous, equally colored.
f. Conidia oblong or elliptic fusoid.
g. Pustules 45–90 μ, subglobose..... *P. vaccinicola.*
gg. Pustules 70–120 μ.
On leaves of *Prunus*..... *P. adusta.*
On needles of conifers..... *P. Cryptomeriae.*
ee. Upper 2 colored cells umber, lowest olivaceous.
g. Pustules 140–280 μ in diam..... *P. stellata.*
dd. Setae 7–17 μ.
e. Colored cells olivaceous, equally colored.
f. Conidia elliptic fusoid, basal cell short obtuse.
g. Pustules epiphyllous, scattered, 75–125 μ.
Setae 3, simple..... *P. pallidicolor.*
gg. Pustules 100–200 μ; on needles.
Setae 3, simple..... *P. macrochaeta.*
ggg. Pustules 90–175 μ, amphigenous.
Setae 3, often 1–4 and branched..... *P. Guepini.*
ff. Conidia clavate, basal cell tapering.. *P. vermiformis.*
ee. Upper 2 colored cells umber, lowest olivaceous.
f. Conidia elliptic-fusoid, basal cell broad conic.
g. Pustules 100–200 μ; setae irregularly divergent; conidia erect.. *P. gibberosa.*
gg. Pustules 170–400 × 80–300 μ; setae disposed at right angles; conidia angulate..... *P. palmarum.*
eee. Upper 2 colored cells fuliginous, lowest olivaceous.
f. Conidia elliptic-fusoid, 18–22 μ.
g. Pustules 50–140 μ in diam..... *P. stictica.*
ddd. Setae 16–25 μ.
e. Upper 2 colored cells fuliginous, lowest olivaceous.
f. Conidia clavate-fusoid, tapering.
g. Pustules globose-lenticular, 75–200 μ..... *P. Menezesiana.*
ccc. Colored cells 10–15 × 7–9 μ.
d. Setae 4–11 μ; conidia elliptic or ovate-fusoid.
e. Upper 2 colored cells umber, lowest olivaceous.
g. Pustules 140–280 μ, subglobose... *P. stellata.*
ee. Colored cells umber or slightly darker, equally colored.

g. Pustules 75–225 μ in diam..... *P. pampeana.*

dd. Setae 7–16 μ.

e. Upper 2 colored cells umber, lowest olivaceous.

f. Conidia broad elliptic, 17–20 μ.

g. Pustules 50–100 μ, subglobose.... *P. Myricae.*

ee. Upper 2 colored cells fuliginous, lowest olivaceous.

f. Conidia elliptic-fusoid, 18–22 μ.

g. Pustules 50–140 μ in diam..... *P. stictica.*

ddd. Setae 15–27 μ.

e. Upper 2 colored cells fuliginous or umber, lowest olivaceous.

f. Conidia clavate-fusoid, tapering.

g. Pustules subglobose, 80–180 μ.... *P. Coccolobae.*

bb. Conidia 19–26 μ.

c. Colored cells 12–16 × 4–6 μ.

d. Setae 8–16 μ, arising from different points on rounded apex.

e. Colored cells very pale olivaceous.

f. Conidia 18–25 μ.

g. Pustules oblong, 220–500 × 100–220 μ..... *P. unicolor.*

cc. Colored cells 12–16 × 5–8 μ.

d. Setae 4–16 μ.

e. Colored cells olivaceous, equally colored.

f. Conidia elliptic fusoid or elliptic oblong.

g. Pustules globose-lenticular, 50–130 μ in diam.

Setae 5–10 μ..... *P. Eugeniae.*

Setae 10–16 μ..... *P. Melicoccae.*

Setae 9–20 μ..... *P. aquatica.*

ff. Conidia slender fusoid-clavate, tapering.

g. Pustules globose-conic, 100–225 μ, setae 3, 9–17 μ..... *P. disseminata.*

gg. Pustules subglobose, 200–250 μ, setae often 2, 6–14 μ..... *P. dichaeta.*

ggg. Pustules lenticular, 160–240 × 80–160 μ..... *P. Micheneri.*

gggg. Pustules conic-hemispherical, 75–150 μ..... *P. microspora.*

ee. Upper 2 colored cells umber, lowest olivaceous.

f. Conidia elliptic-fusoid, basal cell obtuse or inflated.

g. Pustules 200–425 × 170–340 μ ... *P. foedans.*

ff. Conidia slender fusoid, acute at base.

g. Pustules subglobose, 90–225 μ, distributed without order; setae 6–16 μ ..... *P. Gaultheriae.*
gg. Pustules globose-conic, punctiform, 100–150 μ; setae 9–23 μ *P. neglecta.*
ggg. Pustules oblong-elliptic, sparse on pine needles; setae 10–16 μ *P. peregrina.*
gggg. Pustules 75–200 μ, gregarious, on seeds; setae 8–16 μ, conidia often torulose ..... *P. torulosa.*

eee. Upper 2 colored cells fuliginous, lowest olivaceous.
f. Conidia elliptic fusoid, 18–22 μ.
g. Pustules subglobose, 50–140 μ .... *P. stictica.*

dd. Setae 11–27 μ.
e. Median cells olivaceous, equally colored.
f. Conidia elliptic or oblong-fusoid.
g. Pustules subglobose, scattered, 80–130 μ; setae 9–20 μ; colored cells 13–16 μ ..... *P. aquatica.*
gg. Pustules subglobose, punctate, 100–150 μ; setae 18–24 μ; colored cells 14–17 μ ..... *P. Lespedezae.*
ff. Conidia fusoid-clavate.
g. Pustules subglobose, gregarious, 80–150 μ; setae 11–19 μ ..... *P. quercina.*

ee. Upper 2 colored cells umber, lowest olivaceous.
f. Conidia elliptic or oblong fusoid.
g. Pustules subcespitose, punctate, 75–100 μ; setae 12–20 μ ..... *P. bicolor.*
ff. Conidia narrow fusoid, acute.
g. Pustules globose-lenticular, gregarious, 60–200 μ; setae 13–23 μ *P. gracilis.*
gg. Pustules globose-conic, punctiform, 100–150 μ; setae 9–23 μ.. *P. neglecta.*

eee. Upper 2 colored cells fuliginous, lowest olivaceous.
f. Conidia fusoid-clavate, 17–23 μ long.
g. Pustules 75–150 μ, globose-conic, seated without order; setae 12–23 μ; colored cells 13–16 × 7–9 μ ..... *P. leprogena.*
gg. Pustules 75–200 μ, punctiform, subglobose.
Setae 15–27 μ; colored cells 13–15 × 7–9 μ ..... *P. Coccolobae.*
Setae 16–25 μ; colored cells 12–14 × 6–7 μ ..... *P. Menezesiana.*

ff. Conidia up to 26 μ long.
g. Pustules 150–250 μ, seated without order; setae 20–28 μ; colored cells 14–16 × 7–8 μ ..... *P. clavispora.*

ccc. Colored cells 12–16 × 8–10 μ.
d. Setae 12–23 μ.
e. Upper 2 colored cells umber, lowest olivaceous.
f. Conidia oblong or elliptic fusoid.
g. Pustules punctiform, 85–175 μ, setae 12–20 μ ..... *P. japonica.*

ee. Upper 2 colored cells fuliginous, lowest olivaceous.
g. Pustules punctiform, subglobose, 120–160 μ ..... *P. Cliftoniae.*
gg. Pustules loosely gregarious, globose-conic, 75–150 μ; conidia 7–9 μ wide ..... *P. leprogena.*

dd. Setae 15–33 μ.
e. Upper 2 colored cells umber, lowest olivaceous.
f. Conidia ovate-fusoid.
g. Pustules lenticular, 160–250 × 120–160 μ, concentrically disposed ..... *P. curta.*

ee. Upper 2 colored cells fuliginous, lowest olivaceous.
f. Conidia fusoid clavate, 7–9 μ wide.
g. Pustules punctiform, subglobose, 80–180 μ ..... *P. Coccolobae.*

ff. Conidia elliptic fusoid, 8–10 μ wide.
g. Pustules pycnoid, 100–150 μ ..... *P. sphaerelloides.*

cccc. Colored cells 15–19 × 5–8 μ.
d. Setae 4–11 μ.
e. Median colored cells olivaceous or upper 2 umber.
f. Conidia slender fusoid, acute at base.
g. Pustules globose-lenticular, 50–160 μ, setae 4–11 μ ..... *P. Royenae.*

ff. Conidia elliptic fusoid, obtuse at base.
g. Pustules elongate-lenticular, 200–425 × 170–340 μ; setae 5–15 μ, colored cells 14–17 μ ..... *P. foedans.*

dd. Setae 7–20 μ.
e. Upper 2 colored cells umber, lowest olivaceous.
f. Conidia fusoid clavate, acute at base.
g. Pustules globose-conic, seated without order, 100–225 μ ..... *P. disseminata.*

gg. Pustules oblong-elliptic on pine needles: ..... *P. peregrina.*

ff. Conidia oblong fusoid.

g. Pustules hemispherical, gregarious on tubers ..... *P. Batatae.*

gg. Pustules subglobose, gregarious, 100–200 μ on fruits ..... *P. Psidii.*

fff. Conidia elliptic-fusoid, broad conic at base.

g. Pustules subglobose, punctiform, 175–300 μ; colored cells 15–18 $\times$ 7–9 μ; setae 9–20 μ ..... *P. maculiformans.*

gg. Pustules elongate-lenticular, 200–425 $\times$ 170–340 μ, gregarious; colored cells 14–17 $\times$ 6–7 μ; setae 5–15 μ ..... *P. foedans.*

ddd. Setae 17–30 μ.

e. Median cells umber or olivaceous, equally colored.

f. Conidia elliptic fusoid.

g. Pustules subglobose, 100–150 μ ... *P. Lespedezae.*

ee. Upper 2 colored cells umber or fuliginous, lowest olivaceous.

f. Conidia obovate-fusoid, 15–18 $\times$ 7–9 μ.

g. Pustules long hysteriform, 500–1000 $\times$ 100–300 μ ..... *P. scirpina.*

ff. Conidia oblong-elliptic, 15–16 $\times$ 5–7 μ, basal cell obtuse.

g. Pustules subglobose, 100–250 μ... *P. Vaccinii.*

ccccc. Colored cells 15–19 $\times$ 8–11 μ.

d. Setae 9–20 μ.

e. Upper 2 colored cells umber, lowest olivaceous.

f. Conidia broad fusiform, 22–28 $\times$ 7–9 μ.

g. Pustules subglobose, punctiform, 175–300 μ ..... *P. maculiformans.*

ee. Upper 2 colored cells fuliginous, lowest olivaceous.

f. Conidia broad clavate.

g. Pustules subglobose, 175–325 μ... *P. glandicola.*

dd. Setae 17–40 μ.

e. Upper 2 colored cells umber, lowest olivaceous.

f. Conidia elliptic fusoid, basal cell broad conic.

g. Pustules globose-lenticular, 150–300 μ, setae 23–40 μ ..... *P. Sydowiana.*

ff. Conidia broad clavate, basal cell long conic.
g. Pustules small, conic ..... *P. caffra.*
ee. Upper 2 colored cells fuliginous, swollen, lowest olivaceous.
f. Conidia broad fusiform, basal cell broad conic: pustules subglobose.
g. Pustules densely gregarious, 140–420 μ; setae 2–3, sometimes branched, 17–27 μ ..... *P. Rhododendri.*
gg. Pustules 75–225 μ, scattered; setae 3, simple, 18–27 μ ..... *P. versicolor.*
ggg. Pustules 100–200 μ, punctiform; setae 17–35 μ, simple ..... *P. longiseta.*
gggg. Pustules 100–150 μ, seated without order; setae 18–26 μ, simple ..... *P. sphaerelloides.*
ggggg. Pustules oblong-elliptic to hysteriform, 150–1000 × 100–300 μ; setae 18–27 μ ..... *P. scirpina.*
ff. Conidia pyriform, basal cell acute.
g. Pustules 75–200 μ, globose-lenticular, seated without order ..... *P. Tiliae.*
bbb. Conidia 25–30 μ.
c. Colored cells 15–19 × 6–8 μ.
d. Setae 8–22 μ.
e. Median cells umber, equally colored.
f. Conidia elliptic-clavate, conic at base.
g. Pustules globose-lenticular, concentrically arranged, 150–200 μ; setae 10–20 μ, knobbed; colored cells 16–21 × 7–8.5 μ ..... *P. clavata.*
ee. Median cells olivaceous, equally colored.
f. Conidia long fusiform, tapering at base.
g. Pustules subglobose, 125–250 μ, annulately disposed; setae 15–22 μ, frequently knobbed; colored cells 17–21 × 6–8 μ ..... *P. annulata.*
eee. Upper 2 colored cells umber, lowest olivaceous.
f. Conidia narrow clavate, acute at base.
g. Pustules hemispherical-applanate, punctiform, 150–225 μ; setae 13–30 μ ..... *P. Oxyanthi.*
ff. Conidia broad fusiform, 22–28 × 7–9 μ.
g. Pustules subglobose, 175–300 μ, punctiform; setae 9–20 μ ..... *P. maculiformans.*

gg. Pustules hemispherical, gregarious, superficial on tubers; setae 7–16 μ..... *P. Batatae.*

dd. Setae 13–30 μ.

e. Upper 2 colored cells umber, lowest olivaceous.

f. Conidia narrow clavate, acute at base.

g. Pustules hemispherical-applanate, punctiform, 150–225 μ.... *P. Oxyanthi.*

ddd. Setae 25–50 μ.

e. Median cells umber, equally colored, 16–21 × 7–8 μ.

f. Conidia long fusiform, acute at base.

g. Pustules concentrically arranged, 75–200 μ; setae knobbed..... *P. Theae.*

cc. Colored cells 15–18 × 8–11 μ.

d. Setae 9–20 μ.

e. Median cells umber, equally colored, 16–21 × 7–8.5 μ.

f. Conidia 25–30 μ; setae knobbed.

g. Pustules 150–200 μ, subglobose, concentrically disposed..... *P. clavata.*

ee. Upper 2 colored cells umber, lowest olivaceous, 15–18 × 7–9 μ.

f. Conidia 22–28 μ; setae not knobbed.

g. Pustules 175–300 μ, subglobose, punctiform..... *P. maculiformans.*

dd. Setae 18–27 μ.

e. Upper 2 colored cells umber, basal olivaceous.

f. Conidia broad clavate, tapering at base, 24–28 × 8–11 μ.

g. Pustules small, conic, distributed without order..... *P. caffra.*

ee. Upper 2 colored cells fuliginous, swollen, lowest umber.

f. Conidia pyriform, acute at base, 24–29 × 9.5–11.5 μ.

g. Pustules globose-lenticular, distributed without order..... *P. Tiliae.*

ddd. Setae 24–60 μ.

e. Upper 2 colored cells umber, lowest olivaceous.

f. Conidia elliptic-fusoid, 24–28 × 8–9.3 μ, basal cell broad conic.

g. Pustules 150–300 μ, distributed without order..... *P. Sydowiana.*

ee. Upper 2 colored cells fuliginous, lowest olivaceous, basal cell long conic, tapering.

f. Conidia broad clavate, gibbous, 27–30 × 8–10 μ.
g. Pustules 75–150 μ, punctiform ... *P. gibberosa.*
ccc. Colored cells 18–24 × 6–9 μ.
d. Setae 10–22 μ.
e. Median cells umber, equally colored, 16–21 × 7–8.5 μ.
f. Conidia elliptic-clavate, obtuse at base.
g. Pustules 150–200 μ, subglobose, concentrically disposed; setae knobbed, 10–20 μ..... *P. clavata.*
ee. Median colored cells olivaceous, equally colored.
f. Conidia long fusiform, tapering at base.
g. Pustules subglobose, 125–250 μ, annulately disposed; setae 15–22 μ, knobbed, colored cells 17–21 × 6–8 μ..... *P. annulata.*
dd. Setae 22–50 μ.
e. Median cells umber, equally colored or lowest colored cell olivaceous.
f. Conidia long fusoid, tapering at base; colored cells 16–21 × 7–8 μ.
g. Pustules concentrically arranged; setae knobbed, 28–50 μ..... *P. Theae.*
f. Colored cells 18–24 × 7–9 μ.
g. Pustules usually punctiform; setae not knobbed, 22–34 μ..... *P. macrotricha.*
bbbb. Conidia 28–35 μ.
c. Colored cells 18–21 × 6–7 μ.
d. Setae 18–24 μ.
e. Upper 2 colored cells umber, lowest olivaceous.
f. Conidia long fusoid, acute at base.
g. Pustules hysteriform, disposed in series up to 1000 μ..... *P. caudata.*
aaa. Setae 4 or usually 4.
b. Conidia 21–27 μ.
c. Colored cells 15–17 × 6–7 μ, olivaceous, equally colored.
d. Setae 12–17 μ; 3 setae arising from uppermost septum, the 4th terminal.
f. Conidia fusoid-clavate.
g. Pustules subglobose, 120–175 μ... *P. montellica*
cc. Colored cells 14–18 × 7.7–10 μ, olivaceous, equally colored.
d. Setae 9–17 μ.

f. Conidia elliptic-fusoid, obtuse at base.
g. Pustules globose-lenticular, 90–175 μ ..... *P. quadriciliata.*
dd. Setae 30–45 μ.
f. Conidia acute at base.
g. Pustules hysteriform, 300–700 × 140–250 μ ..... *P. Moorei.*
bb. Conidia 29–37 μ.
c. Colored cells 20–26 × 8–10 μ, the 2 upper umber, the lowest olivaceous.
d. Setae 20–40 μ.
f. Conidia long fusiform.
g. Pustules subglobose, 175–350 μ, distributed without order..... *P. Planimi.*
aaaa. Setae 5 or usually 5.
b. Conidia 21–29 μ long.
c. Colored cells 14–18 × 7–9 μ.
d. Setae 8–20 μ.
f. Conidia elliptic-fusoid, basal cell broad conic; colored cells olivaceous.
g. Pustules subglobose, 150–300 μ ... *P. inquinans.*
ff. Conidia clavate-fusoid, basal cell long conoid; upper 2 colored cells umber, lowest olivaceous.
g. Pustules globose-lenticular, 100–300 × 75–175 μ ..... *P. funerea.*
cc. Colored cells 16–20 × 8–10 μ, olivaceous or umber, equally colored.
d. Setae 7–17 μ, knobbed at extremities.
f. Conidia broad fusiform.
g. Pustules subglobose, 100–175 μ... *P. Cesatii.*
dd. Setae 9–24 μ, not knobbed.
f. Conidia broad clavate.
g. Pustules subglobose, 175–300 μ ... *P. polychaetia.*
bb. Conidia 30–40 μ.
c. Colored cells 20–29 × 7–9 μ, olivaceous or upper 2 colored cells darker than lowest.
d. Setae 15–22 μ.
f. Conidia long fusiform.
g. Pustules subglobose, 140–275 μ, distributed without order..... *P. macrospora.*

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THE SOIL FUNGI OF A PINE FOREST

MARIE BETZNER MORROW[1]

In a comparative study of the micro-flora of soils of different plant associations (**2**), it was found that large numbers of fungi prevail in the soil of a pine-oak forest in Bastrop County, Texas. Of about forty square miles in extent this area stands out in contrast to the oak-hickory of the surrounding country, its habitat here marking the westernmost limit of loblolly pine in the state. The western limit of pine follows the contact of two geological formations, the pine being restricted to the Mt. Selman formation, which joins the Carrizo. The latter typically supports oak-hickory with mesquite in local areas, mesquite being rather uniformly found along the contact line. The present investigation is restricted to a taxonomic study of the soil fungi from the pine and environs.

SOILS INVESTIGATED

The following soils were examined: mesquite on the Carrizo geological formation at the pine-mesquite contact; pine on Mt. Selman at the pine-mesquite contact; pine well over in the "pine island" on Mt. Selman formation; and myrtle on ravine banks in the "pine island."

The mechanical analysis of the soils shows the following composition:

Percentage Composition	Mesquite Pine-Mesquite Contact	Pine Pine-Mesquite Contact	Pine Pine-Oak	Myrtle Pine-Oak
Gravel	13.0%	43.0%	9.0%	0.3%
Coarse Sand	5.0	2.0	1.5	28.0
Medium Sand	5.0	5.0	7.0	27.0
Fine Sand	4.5	4.0	21.0	15.0
Very Fine Sand	18.0	30.0	36.0	18.0
Silt	53.0	12.0	19.0	9.0
Clay	5.0	3.0	6.0	1.0

[1] The writer wishes to express her appreciation to Dr. I. M. Lewis, Professor of Botany and Bacteriology, The University of Texas, under whose direction the work was carried on, and to Drs. Charles Thom, Principal Mycologist, Bureau of Chemistry and Soils, U. S. Dept. of Agri., Washington, and J C. Gilman, Associate Professor of Botany, Iowa State College, Ames, Iowa, for help in identifying the species.

The hydrogen ion concentration of the different soils shows the following variation:

pH at 4 inches.....	5.76	6.36	6.23	5.75

METHODS

Samples for the fungous study were taken in July, 1930, at depths of 2 and 4 inches for each soil. 1–1000, 1–10,000, and 1–100,000 dilutions were used for plating, plates for each dilution being made in triplicate, and incubated at room temperature for 3–5 days.

Those forms are included that could be directly isolated on an artificial culture medium. Only those species that appeared more than once on a given dilution plate, or on more than one plate, were considered typical for that particular soil. Waksman's synthetic acid glucose agar (**11**) was used to isolate the fungi, and Czapek's solution agar (**10**) was used along with Waksman's for the cultural studies. The Mucorales do not grow well on Czapek's.

RESULTS

Thus far, 13 genera and some 30 species have been identified, as follows: *Absidia subpoculata* Paine, *Cunninghamella elegans* Lendner, *C. echinulata* Lendner, *Hormodendrum olivaceum* Bonorden, *Acrothecium robustum* Gilman & Abbott, *Fusarium elegantum* Pratt, *Cephalosporium curtipes* Sacc., *Monilia brunnea* Gilman & Abbott, *Gliocladium fimbriatum* Gilman & Abbott, *Rhizopus* 2 species (No. 41 and No. 42),[1] *Thielavia terricola* (Gilman & Abbott) Emmons, *Aspergillus niger* group, 3 strains (No. 21, No. 22 and No. 23) Thom & Church, *A. luchuensis* Inui, *A. fumigatus* Fresenius, *A. flavus* group Link, *A. Tamarii* Kita, *A. alliaceus* Thom & Church, *Penicillium* sp. (No. 1), *P. restrictum* Gilman & Abbott, *P. rugulosum* group Thom, *P. fellutanum* Biourge, *P. intricatum* Thom, *P. guttulosum* Gilman & Abbott, *P. chrysogenum* Thom, *P. lividum* Westling, *P. lilacinum* Thom, *P. Thomii* Maire, *Citromyces fuscus* Sopp., and *C. purpurescens* Sopp.

[1] The writer's culture numbers.

TABLE I

DISTRIBUTION OF SOIL FUNGI

	Mesquite Pine-Mesquite Contact		Pine Pine-Mesquite Contact		Pine Pine-Oak		Myrtle Pine-Oak	
	2 in.	4 in.	2 in.	4 in.	2 in.	4 in.	2 in.	4 in.
Penicillium lividum					+	+		
P. chrysogenum			+					+
P. restrictum			+	+	+	+		
P. rugulosum			+		+			
P. fellutanum	+							+
P. intricatum	+	+						
P. guttulosum	+	+		+				
P. lilacinum	+	+		+				
Penicillium sp. (No. 1)						+	+	+
P. Thomii	+					+		
Citromyces fuscus		+			+		+	+
C. purpurescens		+			+		+	+
Aspergillus niger (No. 21)					+			
A. niger str. (No. 22)	+			+	+	+	+	+
A. niger str. (No. 23)	+			+	+	+	+	+
A. luchuensis	+				+	+		
A. fumigatus	+	+	+	+	+	+		+
A. flavus		+				+		+
A. Tamarii	+	+						+
A. alliaceus	+	+						
Absidia subpoculata					+	+		
Cunninghamella elegans	+	+		+		+		
C. echinulata	+	+				+		+
Hormodendrum olivaceum					+	+		
Acrothecium robustum					+	+		
Fusarium elegantum	+		+	+			+	+
Cephalosporium curtipes		+						
Monilia brunnea	+							
Gliocladium fimbriatum	+	+			+			+
Rhizopus sp. (No. 41)	+	+		+	+	+	+	
Rhizopus sp. (No. 42)	+			+				
Thielavia terricola						+		

Table I shows the distribution of the species at the two depths in each soil.

Contrary to the observation of an earlier worker (7) that *Penicillia* are rare in Texas soils, the dominant types in Texas loblolly pine soil seem to be species of *Penicillium* and the closely related genus *Citromyces*, with *Aspergillus* a close second. *Penicillium* and *Aspergillus* species are found in each soil examined, and at both depths. Soil types with high percentages of sand and silt and a pH range of 5.75 to 6.36 appear to be favorable for these species.

Werkenthin's list (**7**) of fifteen Texas species of fungi isolated from soils of a cotton field near Austin, the campus of the University of Texas, and the greenhouse of the University, at Austin, Texas, includes two species which have been isolated in this study, namely, *Aspergillus niger* and *A. fumigatus*. Ma's list [1] of five *Penicillia* and twelve *Aspergilli* from various soils around Austin, Texas, includes five species of *Aspergillus* and two species of *Penicillium*, strains of which I have found; namely, *A. niger*, *A. fumigatus*, *A. luchuensis*, *A. Tamarii*, *A. flavus*, *P. restrictum*, and *P. lilacinum*.

In so far as I have been able to find in the literature (**1**, **3**, **4**, **5**, **6**, **7**, **8**, **9**) referring to fungi in Texas soils, and exclusive of Miss Ma's verified unpublished list, referred to above, the following species have not been described before this as having come from Texas soils: *Absidia subpoculata*, *Cunninghamella elegans*, *C. echinulata*, *Hormodendrum olivaceum*, *Acrothecium robustum*, *Cephalosporium curtipes*, *Monilia brunnea*, *Gliocladium fimbriatum*, *Fusarium elegantum*, *A. alliaceus*, *Penicillium chrysogenum*, *P. lividum*, *P. rugulosum*, *P. fellutanum*, *P. intricatum*, *P. guttulosum*, *P. Thomii*, *Citromyces fuscus*, and *C. purpurescens*.

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NOTES ON THE PYCNIAL STAGE OF PERIDERMIUM CEREBROIDES

L. S. Gill

(With 3 Text Figures)

The pycnial stage of the common gall-forming caulicolous *Peridermium* on *Pinus radiata* Don, *P. attenuata* Lemmon, and other coastal pines of California has never been reported so far as it has been possible to ascertain. The rust has recently been given the tentative name *Peridermium cerebroides* (?) by Meinecke (**6**), whose work shows that it is distinct from *Peridermium Cerebrum* (Peck) Hedgc. and Long and strongly suggests that it is a separate form or possibly species for which a valid name is lacking.

In other repeating *Peridermia* the pycnial stage is notably inconspicuous. Meinecke (**4**, **5**, **6**) has found it only once in *Cronartium Harknessii* (Moore) Meinecke in the Sierras. Klebahn (**3**) reports that it does not occur regularly on *Peridermium Pini* (Willd.) Kleb. York (**8**, **9**) does not mention pycnia in his more detailed descriptions of the Woodgate Rust, a point which at least suggests that the stage is not conspicuous. A possible exception to the examples just cited may be the Rocky Mountain form of *Peridermium Harknessii* for which conspicuous pycnia have been described by Weir and Hubert (**7**), who make no implication that the stage is scarce. On the other hand there is not sufficient experimental evidence available at present to say conclusively whether or not the rust is also facultatively autoecious.

There is no logical explanation for the inhibition of pycnia in these rusts nor, for that matter, is it fully understood how they are formed at all from mycelium which has developed directly from aeciospores, a condition which the inoculation experiments of Klebahn (**3**) have proven exists in *Peridermium Pini*.

It has been suggested by Jackson (**2**) that the repeating

Peridermia may be "endo" forms, differing from *Endophyllum* in that spore germination is truly aecioid. If such is the case, the production of pycnia could very well be accomplished by atypical nuclear behavior, so common in the reduced rust forms. On the other hand, it is not impossible that the pycnia of *P. cerebroides* (?) which are about to be described signify the presence of a yet undiscovered *Cronartium* stage.

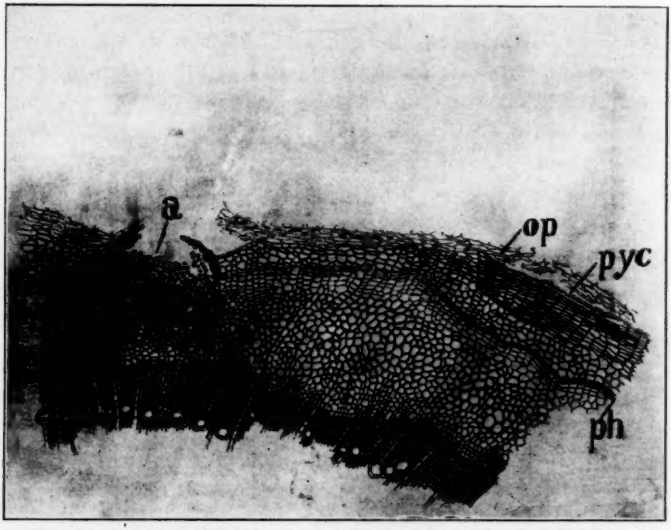

FIG. 1. Cross section through an infected stem of *Pinus radiata* showing aecium *a* arising in the phloem and pycnium *pyc* just under an old layer of periderm *op*. The condition is unusual in that two spore-forms on same gall, and the recently formed layer of phellem *ph* were found in no other case. The usual condition is shown in figure 2. (Drawing traced and slightly reconstructed from an enlarged photomicrograph.)

Pycnia were first noticed on *P. attenuata* in the Santa Cruz Mountains near Boulder Creek, California, at an elevation of about 1500 feet. At this time (Feb. 15, 1930) three galls of approximately a centimeter in diameter on twigs of two young trees about four and eight feet high were found bearing pycnial exudate. The exudate was confined to one or two drops about one millimeter in diameter on each gall; it resembled dark brown molasses in color and viscosity and had a sweet taste. Micro-

scopic examination showed it to contain pycniospores and free-hand sections of the host tissue at the point of exudation revealed a pycnial sorus. A hundred or more galls examined in the field at this time and a number of others which were taken to the laboratory for more critical study showed no signs of pycnia. A few unopened aecia were present.

One week later another stand of *P. attenuata* heavily infected with the rust was visited. This was located about 10 miles southeast of the former station but at least 500 feet lower. A careful field examination there revealed no pycnia. Aecia were rather common but were for the most part unopened. A quantity of short branches bearing young galls 1 to 4 centimeters in diameter were taken to the laboratory. Part of these were immediately examined with the help of a microscope for signs of pycnia but none were found; the rest were kept in the room with their cut ends in water for further observance. Twelve days later a very small gall on one of the latter produced a single drop of pycnial exudate. The others in some cases produced aecia but not pycnia.

A plantation of *Pinus radiata* west of Stanford University at an elevation of 1500 to 1800 feet was examined several times during the month of January 1931. While no exudations or other macroscopic evidences of pycnia were ever found on the rust galls which were abundant there, material collected on two of these occasions showed pycnia when sectioned. Aecia were common but unopened during the first part of the month, but by the 24th they were found in profusion and had begun to open.

A number of old infected Monterey Pines planted on the Stanford campus were studied at frequent intervals during the winter and succeeding spring months of 1930 but no pycnia were found on them. The station in the Santa Cruz Mountains where pycnia were first discovered was visited again in November, 1930, at which time no sign of them could be detected. On January 10, 1931, the pines on Point Lobos and other places about Monterey Bay were inspected but unopened aecia only were found.

Recapitulating for a moment, we see that pycnia were found in the field only once during nearly two years and that internal

sori were found only twice in the scores of galls examined in the laboratory at intervals over the same period. Evidently then, the spore-form occurs rarely and this fact, together with its obscure nature, accounts for its escape from detection in the past. In this connection, the following quotation from Meinecke (6) is of interest:

"It seems likely that, for the two Pacific Coast forms" (*P. cerebroides* and *C. Harknessii*. L.S.G.), "the production of

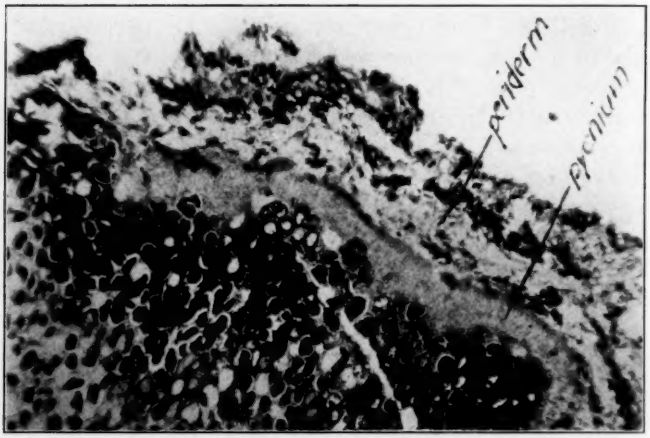

FIG. 2. Cross section through stem of *Pinus attenuata* showing pycnium in normal position with respect to periderm and phloem.

pycnia is simply repressed but not completely suppressed and that internal pycnia may be found in relatively small numbers."

The general morphology of the pycnium appears to be typical of the other so-called blister rusts (*Peridermia*) of conifers. The mature sori were always found immediately below the periderm, whereas aecia invariably originated at a deeper level in more recently formed phloem. This relationship is shown in figure 1, which however is atypical in that it depicts the only case where both spore forms were found on the same gall and where a phellogen occurred below the pycnium, *i.e.* in all other instances the sorus appeared beneath the last-formed layer of cork as in figure 2. The pycniosporophores in the former

material give the impression of having been compressed, a point which suggests that the pycnium may have become imbedded in cork which was laid down the previous growing season. It cannot be said at this time whether or not aecia and pycnia occur in any regular sequence.

No very young pycnia were found, so that a study of the origin and development of the sorus was impossible. The mycelium on which the sorus is produced is uninucleate. It

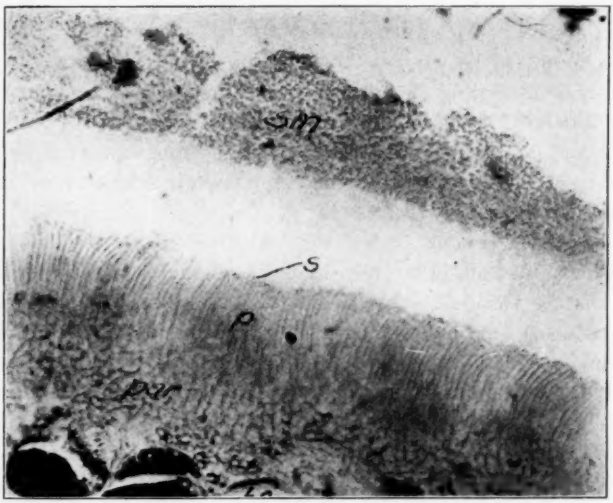

FIG. 3. Section of the pycnium on *Pinus attenuata* showing mass of spores *sm*, spores *s*, sporophores *p*, pseudoparenchyma *par*, and host cells *hc*.

forms a mat of pseudoparenchyma 18 μ to 36 μ thick on which is produced a layer of long straight sporophores (FIG. 3) 15 μ to 30.5 μ in length. The pycniospores are produced in the usual way by budding from the tips of these. The spores are ovate to slightly pyriform, averaging 1.7 $\mu \times$ 3.0 μ in diameter, they are practically hyaline, but filled with contents which color deeply with various nuclear stains. No attempts were made to germinate them or to determine their possible sexual significance.

The sorus appears to be caeomoid, without peridium or other bounding tissue of fungous origin, and is presumably irregular

in shape, although in none of the cases observed could its outline be clearly distinguished. The greatest distance between the edges of any pycnium studied in cross section was 5.5 mm. These characters stand in marked contrast to extensive and distinct pycnia of *P. Cerebrum* Peck described by Dodge and Adams (1).

METHODS

Sections cut from fresh and preserved material were studied in this work. Chrome-acetic and formalin-acetic-alcohol killing agents were used with equal success. The butyl alcohol series was found to be superior to xylol treatment in preparing for paraffin imbedding though it resulted in a slight hardening of the tissues. No special difficulties were encountered in cutting ribbons on a heavy rotary microtome, although paraffin blocks which had been kept under water for a week or more were most easily worked.

The best general stains were Flemming's Triple and the ordinary safranin light green in clove-oil combination. Haidenhain's or Delafield's haematoxylin were best for cytological details. A combination of malachite green and acid fuchsin was found useful in bringing out details of sori. Malachite green and Haidenhain's haematoxylin gave fairly correct differentiation in photomicrographs when panchromatic plates were used without filters.

SUMMARY

1. Pycnia of *Peridermium cerebroides* (?) are here recorded for the first time on *Pinus radiata* and *P. attenuata*.

2. The pycnia are rare and considerably smaller than those of *P. Cerebrum*.

3. So far pycnia have been found only on young galls during the winter months.

4. The sorus appears to be borne on uninucleate mycelium and to correspond in most morphological details with typical pycnia of the caulicolous *Peridermia*.

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THE GENERA OF FUNGI IMPERFECTI[1]

HAROLD B. BENDER

In the course of the preparation of his thesis, "The Genera of Fungi Imperfecti: North American Species and Hosts, with Particular Reference to Connecticut," the writer found five examples where the name given to a previously described genus was employed to designate a more recently described genus.

Accordingly, the writer wishes to change the names of these five more recently described genera:

Coniothyriopsis Petr.	to **Coniothyriopsiella**
Exosporina Arnaud	to **Exosporinella**
Pseudodiplodia Speg.	to **Pseudodiplodiella**
Torulopsis Speg.	to **Torulopsiella**
Vermiculariopsis v. Höhn.	to **Vermiculariopsiella**

A generic description of each of these new-named genera, with their respective species, follows.

Coniothyriopsiella nom. nov.

Coniothyriopsis Petr. Ann. Myc. **21**: 5. 1923. Not *Coniothyriopsis* Speg. Anal. Mus. Nac. Buenos Aires **20** (Ser. 3, 13): 361. 1910. *C. Hualaniae* Speg.

Generic Description: Pycnidia in a stroma which is not typical, dothideoid-formed, strongly developed, warty or cushion-formed, more or less outbreaking, with differentiation into a dark colored outer crust and a brighter colored basal tissue, with many round or quite irregular hollow cavities, the stroma quite regularly complete, or incompletely sunken, one to several, to many layered. Conidiophores short, rod-form, simple. Conidia more or less round, short-ellipsoid or ovoid, one-celled, dark, olive brown.

No other species besides the type: *C. insitiva* (Sacc.) Petr. Ann. Myc. **21**: 7. 1923, which now receives the new name, and becomes: **Coniothyriopsiella insitiva** comb. nov.

Exosporinella nom. nov.

Exosporina Arnaud, Ann. Epiphyt. **7**: 105. 1921. Not *Exosporina* Oud. Versl. Kon. Akad. Wetensch. Amster-

[1] Contribution from the Osborn Botanical Laboratory.

dam **12**: 748. 1904; English translation in Proc. Sect. Sci. Kon. Akad. Wetensch. Amsterdam **6**: 501. 1904. *E. Laricis* Oud.

Generic Description: Sporodochia erumpent or remaining free, with or without a slightly stromatic base. Fertile hyphae absent. Conidia in thick chains, also separating singly, one-celled, dark.

No other species besides the type: *E. manaosensis* Arnaud, Ann. Epiphyt. **7**: 105. 1921, which now receives the new name, and becomes: **Exosporinella manaosensis** comb. nov.

Pseudodiplodiella nom. nov.

Pseudodiplodia Speg. Anal. Soc. Ci. Argent. **90**: 183. 1920. Not *Pseudodiplodia* Karst. Symb. Myc. Fenn. 16, Meddel. Soc. Faun. Fl. Fenn. **11**: 156. 1884. *P. ligniaria* (Karst.) Sacc.

Generic Description: Pycnidia in a hollowed stroma, which is innately superficial, producing chambers with thin walls and without ostioles, black,—the inner wall lighter, and of parenchymatic tissue. Conidiophores simple, hyaline, filiform or absent. Conidia ellipsoid, two-celled, sooty dark brown.

No other species besides the type: *P. aurantiorum* Speg. Anal. Soc. Ci. Argent. **90**: 183. 1920, which now receives the new name, and becomes: **Pseudodiplodiella aurantiorum** comb. nov.

Torulopsiella nom. nov.

Torulopsis Speg. Physis **4**: 292. 1918. Not *Torulopsis* Berl. Giorn. Vit. Enol. Avellino 1895: 54. *T. rosea* Berl.

Generic Description: Sterile hyphae creeping on living organisms. Fertile hyphae superficial, black and cottony, small, wooded, cobwebby, somewhat ragged or somewhat crust-like, exhypopodiate. Conidia borne in neck-like chains on the tips, very little distinct from the fertile hyphae, one-celled, dark green.

The type species: *T. fumaginea* Speg. Physis **4**: 292. 1918, receives the new name, and becomes: **Torulopsiella fumaginea**. Another species described by Speg.: *T. pseudogyroceras* Speg. Anal. Mus. Nac. Hist. Nat. Buenos Aires **31**: 441. 1922, also receives the new name, and becomes: **Torulopsiella pseudogyroceras** comb. nov.

Vermiculariopsiella nom. nov.

Vermiculariopsis v. Höhn. Ber. Deut. Bot. Gesell. **36**: 317. 1918. Not *Vermiculariopsis* Torrend, Broteria Bot. Ser. **10**: 41. 1912. *V. circinotricha* Torrend.

Generic Description: Sporodochia superficial, resting on a subicle, cushion-formed provided with black bristles, underneath small-celled, parenchymatic, above with parallel fibers. Fertile hyphae simple or branched, brush-like, tufted. Conidia borne singly on the tips, fusoid to cylindrical, medium in size, bound in a mass with mucus, one-celled, hyaline.

No other species besides the type: *V. immersa* (Desm.) v. Höhn. Ber. Deut. Bot. Gesell. **36**: 317. 1918, which now receives the new name, and becomes: **Vermiculariopsiella immersa** comb. nov.

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NOTES AND BRIEF ARTICLES

The Rusts of New Zealand [1]

A knowledge of the rusts has been set forth in an attractive volume by G. H. Cunningham, whose writings on the rusts of New Zealand have received favorable attention for a number of years. The author has not only described the species of rusts occurring in New Zealand, with illustrations and helpful comments, but has prefaced the account with an extended rehearsal of the nature of rusts in general and the historical development of knowledge regarding them.

The volume is consequently divided into two parts. Part I, constituting nearly one half of the volume, consists of ten chapters, "written with a view to bringing together in condensed form matter which has been published in many scores of papers scattered throughout the world's periodicals." How thoroughly this has been done is attested by a very complete bibliography covering 20 pages. The author's intention has been to arrange the different chapters so that the student may obtain a knowledge of structure and behavior that will enable him to comprehend the second part of the work. If this object is defeated it will be due to the unavoidable multiplicity of detail and the inherent complexity of the subject.

Space will not permit more than a cursory view of the chapters. This is less to be regretted, as the author is inclined to be conservative and, while bringing the work down to the present, rarely presents opinions that will not be accepted by nearly every student. It is, therefore, no surprise to find that the first chapter deals with spore forms, which are designated as pycniospores, aecidiospores, uredospores, teleutospores and basidiospores. After a few comments on alternation of generations and sexuality, we pass to the second chapter on germination and viability of spores.

[1] Cunningham, G. H. The rust fungi of New Zealand, together with the biology, cytology and therapeutics of the Uredinales. Printed privately by John McIndoe, Dunedin, N. Z. 1831. 261 pp. *175 figs.* in text, *3 pl.*

The third chapter is devoted to the entry and penetration of the host, including galls and malformations. The dissemination of the spores finds place in chapter 4, and heteroecism and the host factors that affect parasitism are discussed in chapter 5.

An extended and excellent account of biologic and physiologic specialization as illustrated in the five or six principal cereal rusts occupies chapter 6. The author favors the use of "biologic forms" for the subdivisions of a species often called races or forms, and "biotypes" for secondary subdivisions, a term lately proposed by Scheibe. Although fifteen pages are given to this topic no use is made of the information in the systematic part, partly because the several rusts involved are absent or introduced to a limited extent in New Zealand.

Chapter 7 on therapeutics deals with the methods employed to control rusts affecting cultivated plants. It is in chapter 8 that the author sums up his studies on the relationship of genera and orders, and condenses his views into a well constructed graph. No student interested in the evolution of the rusts should fail to consider the arguments here presented. An excellent and very helpful chapter on technique in its broadest sense fills no. 9, and a few words on classification in chapter 10, showing that no generally acceptable scheme has yet been evolved, close the first part.

In the second part 146 species are described, over one half being endemic. All but six or seven of these endemic species were discovered and made known to the world by Dr. Cunningham, which entitles him to more than usual consideration in a discussion of the rust flora of the country. It also opens up a brilliant future for further study, as 34 species, mostly endemic, are undistributed forms in the form-genera *Aecidium*, *Caeoma* and *Uredo*. There are 33 introduced species, about half falling under the Gramineae and Leguminosae.

In two notable instances, *Puccinia Hydrocotyles* and *P. Dicondrae*, the full life cycle is commonly developed in New Zealand, and nowhere else. In North America the former occurs only as uredinia and has been considered to be a species without aecia, while the latter occurs only as telia, and was believed to be a microcyclic species.

The author is devoted to the International Rules of Nomenclature, especially in accepting 1801 as the initial date for priority, and in ignoring uredo names. The latter leads him, as it has others, into the erroneous statement, that the spores in the type material of the genus *Milesia* "may have belonged to any one of several genera." This is not only a false statement, but it implies that the genus is not distinguished by its urediniospores. The fact is the teliospores have no diagnostic value, except to show that the genus belongs to the Melampsoraceae. They supply no generic or specific characters. Otherwise, how could Dr. Cunningham have placed his new endemic rust on *Histeropteris* in the genus with only uredinia known?

The successful publication of the volume, carried out under trying conditions, is a highly valuable contribution to a better knowledge of the rusts. It is a fitting companion to McAlpine's "Rusts of Australia." It stands on its own merits, however, as only a few species are common to the two countries.—J. C. ARTHUR.

MYCOLOGICAL NOMENCLATURE

In spite of international congresses on botanical nomenclature, it appears that mycologists still have a long and difficult road to travel before they will be able to enjoy any degree of stability in nomenclature. In the past, this lack of stability has been caused partially by the fact that there have been two codes of nomenclature, each with its ardent adherents, and partly because of the diversity of personal opinions. Since the former difficulty has been fairly well solved, there remains the latter to be considered. Unfortunately, in so doing, the case becomes rather personal and hence we hasten to state that there is no motive of personal animosity, but rather a fond hope that by this discussion we may help to crystallize opinion on certain phases of the problem of nomenclature.

One of us (Guba, Phytopathology **19**: 201–232. 1929) adopted the original generic name *Pestalotia* instead of the later *Pestalozzia*, and at the same time elevated a subspecies to species rank. This subspecies was *Pestalozzia Guepini Vaccinii* Shear (Bull. Torrey Club **29**: 456–457. 1902), which, for some reason not stated, that author has preferred to maintain in a subsequent

paper (U. S. D. A. Tech. Bull. 248: 9. 1931) and of which he made *P. Vaccinii* (Shear) Guba a synonym. The modified name *Pestalozzia* also appears in "The Genera of Fungi," Clements and Shear (New York, 1931).

First let us consider the matter of the choice between the two names. The change from *Pestalotia*, as the name was originally spelled by de Notaris (Micromycetes italici. Dec. II. Mem. Acad. Sci. Torino II. **3**: 80–81. 1839), to *Pestalozzia* apparently was made by Corda (Ic. Fung. **5**: 34. 1842) but Fairman (Mycologia **5**: 245. 1913) was the first to return to the original spelling, being influenced to do so by the competent opinions of Dr. Barnhart, Librarian of the New York Botanical Garden, and Professor Henry F. Burton of the Department of Latin in Rochester University. Dr. Barnhart rendered the opinion that *Pestalotia* is as euphonious as *Pestalozzia* and preferable to it, as it shows an Italian botanist's view of the correct Latinization of an Italian name. Dr. Burton opined that Pestalotius is undoubtedly the correct Latin form for Pestalozzi: classical Latin has no "z" sound or character except in a few words borrowed from the Greek. The "z" or "zz" often stands for the Latin "t" or "ti" as in Palazzo (Palatium), Arezzo (Arretium), Firenze (Florentia) and Venezia (Venetia).

While the writers feel that the use of *Pestalozzia* might possibly be condoned on the ground of usage, yet if we accept usage in this case, we cannot accept the name *Helicoum* as proposed by Shear in "The Genera of Fungi" since *Helicoön* was the name originally given to the genus by Morgan (Cincinnati Soc. Nat. Hist. Jour. **15**: 50. 1892), and is the name that has been used exclusively since that time. If the proposed name is a correction, certainly usage cannot be assumed; then Shear's position is inconsistent. Furthermore, we feel that, in contrast to the statement to be found on page 15 of "The Genera of Fungi" in which it is stated that "Names of more than six syllables have been shortened in such a manner as to preserve their identity," *Helicoum* resembles *Helicoön* no more than it does *Helicoma* and is more likely to be confused with the latter. We therefore unhesitatingly condemn the practice of name changing on the mere plea of better phonetics and of brevity, and feel that

the original spelling, even though in error, should be insisted upon.

There is another phase of the problem of nomenclature that should also be considered, and this is brought up by Shear's treatment of *Pestalotia Vaccinii*. Complications arise through the fact that Desmazières described the species as occurring both on *Camellia* and *Magnolia*. His description and illustration of *P. Guepini* (Ann. Sci. Nat. II. **13**: 182–184. *pl. 4, fig. 1–3.* 1840) do not fit the specimen of the fungus on leaves of *Camellia* distributed in Desmazières' Pl. Crypt. **22**: 1084 nor any other of the numerous later exsiccatae of *P. Guepini* on *Camellia*. Desmazières' colored illustration of *P. Guepini* embraces fig. 1, a leaf of *Camellia* bearing the fungus; fig. 2, a portion of the upper surface of the leaf with acervuli much enlarged; and fig. 3, conidia. The question arises as to whether Desmazières could have selected the fungus on *Magnolia* leaves as a basis for preparing the type description of *P. Guepini* and for his figure of the conidia, rather than the fungus on *Camellia* leaves, since both plants are given as hosts in the type description. This would appear very unusual and unlikely since Desmazières' illustration of *P. Guepini* includes a figure of the fungus on a *Camellia* leaf, and also since the leaves of that host are the only ones distributed in the exsiccata. While the fungus on *Magnolia* would be welcomed for study, it has not been found. Therefore, the fungus on *Camellia* should be considered the type, even though Desmazières' description and illustration of the conidia do not agree with it. Exsiccatae published after the one in question support this view, and if usage adds additional weight, then it would appear that the case is closed.

With the preceding facts in mind, it is difficult to explain Dr. Shear's attitude in regard to *P. Guepini Vaccinii* Shear. He states (*l.c.*) that *P. Guepini Vaccinii* agrees fairly well in many respects with the description and figure of *P. Guepini* and differs decidedly from specimens issued in certain exsiccatae of that species. These exsiccatae agree with Desmazières' specimen of *P. Guepini* on *Camellia*. There is, however, nothing in the type description of *P. Guepini* which might be construed as being in agreement with *P. Guepini Vaccinii*. Desmazières'

description and figure of the conidia are worthless as a basis for comparison. Furthermore, the species on cranberry is entirely different from that on *Camellia;* hence it is difficult to understand why Dr. Shear implied any relationship between the two. In the words of Shear (U. S. D. A. Bur. Pl. Ind. Bull. 110: 39. 1907) "*Pestalozzia Guepini* is given by Farlow and Seymour [60] as occurring on the cranberry but a study of that species indicates that our plant (*P. Guepini Vaccinii* Shear) [22] is a variety at least as indicated and may perhaps be found to be a distinct species." It is therefore surprising that Dr. Shear refuses to recognize the specific rank and distinctness of the fungus on cranberry, and furthermore that he should insist on the use of a trinomial in violation of the International Code.

Without going into an extensive review of "The Genera of Fungi" we find similar misconceptions in regard to the validity of names. For example one of us (Linder, Ann. Missouri Bot. Gard. **16**: 227–388. 1929) has made *Lituaria stigmatea* Reiss a synonym of *Helicoma stigmateum* (Reiss) Linder, yet in "The Genera of Fungi" the earlier name is not only recognized but placed in a different, though related, subfamily. A full discussion of the species was given on page 299 in which it was stated that "If, however, Reiss' figures are compared with those of Potebnia, then the identity of the two species, *H. stigmateum* and *H. Sphaeropsidis*, becomes quite evident, since they not only agree in appearance, but also in spore measurements. The fact that Reiss states that the spores are non-septate should not be considered too seriously as an objection since the septa, because of the small size of the spores and their refractive nature, would not be visible except under a high magnification or by the aid of stains. Further evidence of the identity is the similarity of habitat which Reiss states as "auf der Rinde eines dürren, feuchtliegenden Ulmenzweiges, welches von Sphärien bewohnt war." Jaap's material occurred on *Diplodia inquinans* and Potebnia's, otherwise admitted by him to be identical with Jaap's *H. niveus*, is stated to be parasitic on *Sphaeropsis pseudodiplodia*." In view of the fact that Reiss' type is no longer in existence, it must be admitted that there is still room for doubt, yet it seems that the disposition already made is preferable to juggling the species among the various groups of Imperfecti.

Although other examples of a similar nature could be cited, enough has been said to emphasize our second point, namely that, in a monographic study, considerable investigation, tremendous effort and patience, and an equal amount of thought are involved, with the one idea that a more accurate and stable nomenclature might result from such labors. It would therefore seem far better to discard names that are shown to be unacceptable than to carry them along in the literature and thus perpetuate confusion.—E. F. GUBA, Massachusetts Agricultural Experiment Station, Field Station, Waltham, Mass., and D. H. LINDER, Biological Institute, Harvard University, Cambridge, Mass.